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ANALYSIS OF FOOD PRODUCTION AND IMPORTS

1965 - 1984

(A STATISTICAL ANALYSIS)

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INTRODUCTION

1. The average person in developing Africa [1/] has less access to food today than 20 years ago and average dietary standards are considerably below minimum nutritional standards. Between 1965 and 1984 the region's population increased from 295 millions to 503 millions an increase of 70.5 per cent at an average annual growth rate of 2.9 per cent. In the same period, the production of basic food commodities increased from 117.0 million tons to 163.3 million tons, an increase of 39.5 per cent, at an average annual rate of 1.8 per cent. Thus, food production was estimated to have grown at at about one-half the growth of population. This adverse situation was not limtied to basic food production. The decline in the overall economic performance of developing Africa which began in the late 1960s also intensified.

2. The gross domestic product (GDP), the single most important determinant of economic growth, of the region grew at an annual rate of five per cent in the first half of the 1960s, then slowed somewhat towards the end of that decade. Between 1970-1980 GDP decelerated to about 3.5 per cent albeit a slight improvement to 4.3 per cent was recorded by the end of the decade. The beginning years of the 1980s reversed this when GDP growth slumped to one half of one per cent in 1981-1982. However in 1982 a slightly better performance of agricultral GDP over 1981 was achieved. It did not last. In 1983 food and agricultural production declined by 3.1 per cent and 2.8 per cent respectively compared to 1982. The most affected areas being the North and West African subregions with decreases of 7.4 and 11.1 per cent respectively in food production. By the end of 1983, no less than 24 African countries were suffering from, or threatened by, acute food shortages. This situation occurred during the time (1980-1985) when the Lagos Plan of Action had hoped to achieve its medium term goals — self sufficiency in, among other things, food and agriculture in Africa.

3. While about 70 per cent of developing Africa's rapidly growing population live in the rural areas where agriculture is the primary economic activity (Table 1), it is a paradox that the region is at the present time the only one where the trend rate of growth in food production continues to be below that of population (Figure 1). The problem seems to be one of production deficiencies compounded by drought.

4. This paper attempts to analyse the trends in food production and food imports of developing Africa over the 20 year period 1965-1984. It therefore makes a distinction between food production and non-food production, the latter of which it does not cover. However, reference made to agricultural production include non-food production. The paper analyses food production and food imports on the basis of the available data relating to the basic food commodity groups, namely: cereals, roots and tubers, pulses and meat. These food groups are however of particular importance to, and from the bulk of, the food consumption in the region. Fisheries are not covered, but the trend in this sub-sector points in the same direction as other foods. Fishery -- nominal catches — increased from 2.9 million tons in 1970 to 3.9 million tons in 1975 and thereafter decreased annually until 1980 when recorded catches were 3.3 million tons. Catches in 1981 and 1982 were 3.4 million tons each year.

1/ Africa excluding South Africa.

Production

5. Agriculture's contribution to aggregate GDP in the late 1960s was about 40 per cent. Between 1976 and 1980 the sector's dominance in GDP was eroded. Its contribution fell to 32 per cent by 1970 and further to 22 per cent by 1980 (Table 1). By then the services sector -- distribution, finance, communications government, etc. -- had emerged as the dominant contributor to GDP with a share of 50 per cent in 1980 as against 46 per cent in 1976. Industry remained more or less constant at 28 per cent, though there were recorded decreases in its contribution for a number of years especially in the mid-1970s due to, among other things, capacity underutilization.

6. Production of food crops, sugar and meat, rose at an average rate of 1.1 per cent annually during 1965-1974, down from 2.2 per cent in the previous decade. Over the 20 year period, output increased at 1.8 per cent per annum. During the same period, population increased by an annual average of 2.7 per cent and by 3.0 per cent during 1975-1984. The available data indicate that food production fared better during the five years 1965-1969 than at any other period since. Within this period food output increased by 3 per cent annually, slightly above the population increase of 2.7 per cent. Thereafter, the trend rate of growth of food production was stagnant at first, then fell. It has continued to be below that of the population.

7. While population grew continuously from 2.8 per cent annually in the late 1960s to 3.1 per cent in the beginning years of the 1980s, growth in food production fell from 3.3 per cent in 1965-1969 to 1.3 per cent by 1980. Growth during 1980-1984 was negligible, a mere 0.3 per cent (Table 2). The region's food self sufficiency ratio dropped from 98 per cent in the 1960s to about 86 per cent by 1980, implying that about 12 per cent less domestically produced food was available per capita in 1980 than 20 years earlier. The decline has sharpened further, especially during 1983-1984.

8. The exponential per capital food growth was a negative 1.0 per cent during 1969-1984. Within this period, per capita production showed sharp declins from minus 1.6 per cent in 1975-1979, to minus 2.6 per cent nn 1980-1984. (Table 2). Per capita declines ranging from 2.0 per cent to 4.1 per cent were recorded for the North, West, Central, and East and Southern subregions. Of the 52 African countries for which data were available 36 suffered production declines, (Algeria with as high as 5.7 per cent, Botswana 8.6,p Cape Verde 10.9, Chad 4.7, Ethiopia 5.3, Kenya 5.0, Lesotho 9.5, Niger 8.8, Tanzania, United Republic, 5.1, Togo 4.7, and Zimbabwe 11.6). Among countries which suffered sharp falls in their per capita production of food are some most endowed with large agricultural potential.

11. Aggregate production of cereals, principally millet and sorghum (in the Sudan and Sahelian countries), maize (in East and Southern Africa), rice (in Madagascar and parts of West Africa), accounting for about one quarter of all food produced in the region, fluctuated. Production reached 55.7 million tons in 1974 as against 45.1 million tons in 1965 at an average annual growth of 1.3 per cent. The highest annual growth for the period, 3.7 per cent was reached in the five year period 1965-1969. Thereafter, growth declined to 2.0 per cent in 1970-1974. The rather marginal growth in cereal production was amajor contributor to the slowing down in food production. Yield per hectare, regarded as a measure of productivity, was 6.1 per cent higher in 1978-1979 than in 1973-1974 for developing Africa, 12.6 per cent for developing market economies, 14.7 per cent for Asia and 4.7 per cent for Latin America. In other words, developing Africa's cereal yield per hectare was less than that of Asia but higher than that of Latin America. Comparable data for 1983-1984 over 1973-1974 are, developing market economies 23.9 per cent, Asia 24.6 per cent, Latin America 23.0 per cent and developing Africa 7.0 per cent. Thus developing Africa recorded the lowest yield per hectare, estimated at 1090 kg on average, compared to the world average of about 2000 kg per hectare.

12. Roots and tubers (cassava, yams and sweet potatoes, produced mainly in West and Central Africa), another important food commodity group, showed a somewhat better production trend than cereals. From 62.2 million tons in 1965, production increased at an average annual rate of 2.0 per cent to reach 90.6 million tons in 1984. The group's contribution to total food productoon increased from 54 per cent in 1965 to 57 per cent in 1984, while that of cereals decreased from 39 per cent to 35 per cent.

13. However, the trend rate of growth of roots and tubers decreased from 2.9 in 1965-1969 to 2.0 per cent by 1980-1984. The group's average growth was slightly higher than that of all food. During 1975-1984, 12 countries showed negative average annual growth rates ranging from 0.3 per cent to 14.1 per cent in their production of roots and tubers, the most seriously affected countries being Gambia and Senegal, while the highest growth recorded, 20 per cent, was in Lesotho. Other countries which recorded significant growth during 1975-1984 were: Botswana (16.7 per cent), Guinea Bissau (11.7 per cent), Morocco (16.5 per cent) and Swaziland (11.2 per cent). In the case of cereals, for the same 10 year period, negative growth of up to 50 per cent was recorded for 16 countries, the most seriously affected being Congo (10.3 per cent) and Mauritius (50.0 per cent).

14. The per capita food production trend during 1965-1984 reveals serious production crisis. It slipped from an annual average of 0.6 per cent in the five year period 1965-1969 to a negative 1.1 per cent during 1970-1974 and further to negative 1.6 per cent in 1975-1979. It was a negative 2.6 per cent in 1980-1984, 0.5 per cent higher than that for the twenty year period 1965-1984. In the case of cereals for example, per capita exponential growth was negative throughout, the worst period being 1982-1983 when a decrease of 15.1 per cent was recorded. The position improved during 1983-1984 with a negative growth of only 2.5 per cent. As regards roots and tubers the position was less critical with recorded marginal growth for most of the period. Negative growth was recorded only in three periods 1965-1966 (1.4 per cent), 1969-1970 (2.1 per cent) and 1982-1983 (2.6 per cent).

15. In quantity terms, meat has occupied a relatively small place in total food production, accounting for 3.8 per cent of total food production in 1984 as against 3.2 per cent in 1965. One of the major sources of proteins in the region, meat production rose steadily, though moderately, throughout the period at an averag annual rate of 2.8 per cent. The regional data indicate a somewhat faster growth in production in 1975-1984 (3.2 per cent) than during 1965-1974 (2.4 per cent). Growth was positive throughout the 20 year period except for 1966-1967 and 1970-1971 when it was a negative 0.3 per cent for each period.

Subregional production patterns

16. The subregional food production trends show considerable variation in the past two decades, but they all point in the same direction, minimal, decreasing or negative growth.

17. The North African subregion registered the second highest average growth in basic food production of 2.3 per cent, after Central Africa with 2.7 per cent. Growth was highest during 1965-1969 with 5.1 per cent. This was as a result of impressive performances in Algeria (10.5 per cent), Morocco (18.6 per cent) and Sudan (10.6 per cent). Thereafter it fell to 1.5 per cent by 1979, and further to negative 1.1 per cent in 1980-1984. Production during 1975-1984 was under 1.0 per cent. Unlike in 1965-1969 when only Tunisia recorded a negative growth of 6.7 per cent, three countries, Algeria, Sudan and Tunisia recorded negative food production growth in 1980-1984. The growth points in the 20-year period were Algeria (6.9 per cent), Morocco (9.4 per cent) and Libyan Arab Jamahiriya (9.9 per cent). Notwithstanding, for the subregion as a whole, the annual food production growth of 2.3 per cent lagged behind population's growth rate of 2.8 per cent.

18. West African subregion accounts for about one third of developing Africa's growing population. Annual population growth in the subregion was 3.0 per cent in 1975-1984, up 0.4 per cent on the 1965-1975 rate. Of the subregions, West Africa recorded the lowest aggregate (1.2 per cent), and highest negative per capita food production growth in 1965-1974. While production was not significant in the following decade, because of sluggish trends in the other subregions West Africa's trends looked better albeit negative per capita food production was recorded for 11 out of 16 countries in the period. Increase in food production was achieved in some parts of the subregion, but this has been more as a result of expansion of the land under cultivation than of higher production per acre. Even the occasional increase in volume of production continues to be outstripped by population growth. West Africa was the only subregion where the trend rate of growth in food production stayed below that of population throughout 1965-1984. Food production growth was 1.2 per cent per year during 1965-1974, and 1.4 per cent in 1975-1984 as well as in 1965-1984.

19. The highest subregional food production growth for the 20 year period, 2.7 per cent, was recorded in the Central African subregion. However, with an annual population growth of 2.9 per cent for the period, one-half and four-fifths of the countries of the subregion showed negative per capita food production in 1965- , and 1975-1984 respectively. The best growth performance, 4.5 per cent, was achieved during 1965-1969, thereafter, production trends declined along with those of the other subregions. Improvements were recorded during 1980-1984, when Central Africa's food growth was 2.2 per cent.

20. East and Southern Africa, after West Africa, has the second highest percentage of developing Africa's population. Estimated at about 26 per cent of Africa's population, the subregion's share in total food production in 1984 was 17 per cent, up 1.0 per cent on its 1965 share. During 1965-1984, food production in the subregion grew at an annual rate of 2.0 per cent, 1.0 per cent lower than annual population growth. Here as in the other subregions, growth in food production was slower in the 1970s than in the 1960s, with the rate in 1970-74 being one-half that in 1965-1969. Consequently, by 1984, per capita food production growth was negative in 12 out of 18 countries in the subregion.

Domestic supply and demand

21. Perhaps the most disturbing feature of food production in most African countries over the past two decades, particularly so during the last, is its rate of growth, minimal at best, and normally sluggish or negative. Domestic food production consistently failed to meet demand resulting primarily from rapid population growth to the extent that during 1971-1980 there were food gaps in 37 of 45 countries. (Table 3).

22. Consequently, imports of food grains (wheat, rice and maize) soared. Developing Africa's volume index of imports (1980=100) moved from 44 in 1965 to 113 in 1978; dropped to 92 in 1979 but rose again to 115 in 1981. It fell to 112 in 1982. A sharper decline to 95 was recorded for 1983. The decline was due more to balance-of-payments and fascal crises and import policies than to increased domestic production. The volume index of exports fell from a high of 139 in 1972 to 71 in 1983, down 12 points on its 1965 level. While the unit value index of imports rose from 24 in 1965 to 97 in 1981, then dropped to 94 in 1982 and 91 in 1983, that of exports moved from 10 to 12 in 1965-1972. Between 1973 and 1983 the unit value index of exports moved much faster, from 17 to 84, but not as fast as the unit value index of imports. This resulted in terms-of-trade determination for most countries of the region, with a few exceptions, most of these being oil exporting countries. From 41 in 1965, developing Africa's terms-of-trade moved to 95 in 1983 with a high of 107 in 1981.

Imports

23. The slow, sluggish and largely negative growth in food production during the last two decades and the concomitant deficit in domestic food production led to substantial increases in commercial imports of food and food aid. Food imports grew substantially except sugar. However serious declines in both the volume and value of African exports, deterioration in terms-of-trade and balance-of-payments crisis severely limited the region's capacity for commercial imports, and much of domestic food deficits was made up from food aid.

24. Imports of cereals soared by about 9 per cent a year, increasing from 4.9 million tons in 1965 to 22 million tons in 1983. In US dollars value terms, imports rose from 0.5 billion in 1970 to 4.5 billion in 1983. Over 60 per cent of cereal requirement reacrued for some countries were met from imports with the result that imports of the grain rose to 18 per cent of staple food consumption in 1984 as against 5 per cent in 1970.

25. Available data do not permit a breakdown of imports into commercial purchases and food aid for most countries. Nevertheless, information for 21 countries reveal that in 1983 food aid averaged 54 per cent of total cereal imports. Indications of the extent of the pressure of food imports on the balance-of-payments of African countries is given by the value of imports of cereal grains, pulses, sugar and meat. Imports of these items rose from US$0.7 billion in 1970 to US$7.2 billion in 1983, although the value declined by 5 per cent in 1983 over 1982.

26. Food imports continue to absorb a large proportion of export earnings of a good numbers of countries leaving little for other essential development imports. Food items averaged 20 per cent of total imports for developing Africa between 1965 and 1982. Data available for 39 countries for 1982 show that in one half of these countries food imports accounted for over 30 per cent and six cases over 70 per cent of export earnings, with serious implications for economic development. Developing Africa's external debt climbed from US$15.6 billion in 1971 to US$107.3 billion in 1983, while debt service, (i.e. interest payments) rose from US$0.3 billion to US$4.5 billion for the same period.

Some neglects

27. Agriculture plays an important role in African economies. However, as the Lagos Plan of Action rightly acknowledges "the root of the food problem in Africa is the fact that governments have not usually accorded the necessary priority to agriculture both in the allocation of resources and in giving sufficient attention to policies for the promotion of productivity and improvement of rural life".

28. In the last two decades or so, African agriculture failed to engineer growth in the other sectors. Food production failed to keep pace with demand, resulting in consumption per person well below nutritional requirements. Output did increase but not as fast as demand; when increases occurred they were due largely to expansion of area under cultivation. Productivity stagnated at best, both in terms of labour and land and per capita production of basic food grains in recent years shows significant increases for all developing regions of the world except Africa. During 1965-1969 roots and tubers grew at 2.9 per cent annually; by 1980-1984 growth was down 1 per cent on the 1965-1969 level. Corresponding figures for cereals were 3.7 per cent in 1965-1969 and negative 2.5 per cent in 1980-1984.

29. What is significant is that the sharpest declines occurred during the period when the nature and magnitude of the deterioration in the food situation in the region had been recognized and appropriate frame-work for sustained national and subregional efforts had been provided 1/. The largest overall agricultural production of 4 per cent annually (1980-1985) was not achieved, instead production grew by less than half of one per cent against a population growth of 3.1 per cent. There were some obvious reasons for this.

30. The Lagos Plan of Action was discussed with enthusiasm. However, although the basic framework for action had been drawn-up and the development strategies mapped, the relative responsibilities of the parties for appropriate action have still not yet been fully assumed. There simply does not exist at the subregional and regional levels the same instruments for policy implementation which are available, and usually taken for granted, at national levels.

31. One of the objectives of the LPA over the years 1980-1985 was to bring about immediate improvement in the food situation and lay the foundations for self-sufficiency in food and agricultural production. In spite of that commitment overall public sector expenditure on agriculture has continued to be minimal in most countries of the region. Data are far from complete and in some cases weak, but indicate that public sector expenditure on agriculture -- current and capital -- in most countries has been less than 10 per cent of total public sector expenditure. In the 1970s expenditure on agriculture averaged 7.7 per cent for 22 countries and 8.6 per cent during 1980-1983. For Asia and the Pacific the corresponding figure for 1980-1983 was 11.3 per cent. The subregional picture of growth in agricultural expenditure was itself far from impressive. Over the period 1979-1982 there were recorded negative growth in expenditure in all the subregions except West Africa where a 2.1 per cent annual increase was shown. Negative growth of 2.6 per cent are shown for North Africa, 9.3 for Central Africa and 2.2 for East and Southern Africa. Although public sector resources have grown, though by slower rates in recent years, the budgetary allocations to food and agriculture have declined in real terms.

1/ FAO Regional Food Plan for Africa (1978-1984). The Lagos Plan of Action (LPA).

32. While the potentials of research are not in doubt, inadequate attention to agricultural research in most countries of Africa has been a significant factor in retaring production growth. Part of the reason is the mistaken belief that technology transfer and research achievement in other regions could be effectively imported into Africa without major domestic research effort. The experience of research institutions in the region has proved this wrong.

33. Conditions are different. Variations in rainfall, in soils and in farming techniques explain why importation of high-yielding seed varieties have not been as successful in Africa as they have been in the areas where they were developed. Research has shown that crop varieties which have proved successful in Africa have been for the most part those derived from indigenous African genetic stock. Appropriate technologies must be developed that are suited to African conditions and needs.

34. A related problem is infrastructure. Not enough attention has been paid to the transport sector which is literally an engine of growth. Farmers need proper transportation network, feeder roads, as well as fertilizers, facilities for irrigation, proper and sufficient storage capacity, etc. The rather, low social status accorded to farmers in the region does not help agricultural growth. More attention is now being given to women's role in agriculture than in the past. The role of millions of women in African agriculture is significant, but little information is available in this area. Most women in agriculture have little access to credit, technical services and markets, yet they are helping their families survive on small subsistence holdings. Increased attention to and recognition of the role of women in African agriculture, and adoption of the necessary policies that would motivate farmers towards higher productivity would help increase food and agricultural production.

Conclusion

35. The rate of growth of food and agriculture in most African countries in the last two decades has been slow, while that of population has been rapid. This resulted in excess demand over domestic supply of food and increased food imports and food aid. During the period, food imports increased four-and-half times, yet the average African has less food today than he had 20 years ago. Agriculture which should have been the engine of growth in other sectors failed to make any worthwhile contribution to national and regional growth and the poor performance of the sector has been one of the chief causes of the present economic crisis.

36. The region is in a food crisis as well as an economic crisis. Its economic history over the last 20 years is one of decline. Performance declined in all sectors. In the agricultural sector drought has been partly a cause. However, the drought has only recently intensified, particularly in 1983 and 1984.

37. The current African food crisis is the result of the long neglect of the agricultural sector by all concerned. Concerted and co-ordinated action for the sector's rehabilitation and revitalization is the key element to the solution of the situation.

38. The priority programme for the economic recovery of Africa (1986-1990) adopted by the Assembly of Heads of State and Government of the Organization of African Unity at its 21st Ordinary Session, 1985, and also the high priority that African governments individually as well as collectively have accorded to the rehabilitation and development of the food and agricultural sector are very welcome moves. However, as the Lagos Plan of Action rightly states, African governments are the prime movers and ultimate arbiters of their drive for increased food self-sufficiency. The lesson is clear. It is not enough to say that Africa must be self-sufficient in food. It is also important to consider how production is to be organized and supported by stepping up research and other facilities significantly. Africa is able to produce enough to feed itself, and more.

DEVELOPING AFRICA

Table 1: Agriculture in the Economy

Agriculture GDP as Percentage of Total GDP

Subregion	1960	1965	1970	1983
NORTH AFRICA	30.3	26.3	21.2	14.1
Algeria	21.4	20.3	13.2	8.5
Egypt	29.3	28.6	29.4	16.9
Morocco	32.2	31.7	22.8	15.3
Socialist People's Libyan Arab Jamahiriya	15.4	5.1	2.6	3.7
Sudan	57.5	47.7	44.5	38.5
Tunisia	29.1	22.1	19.3	13.8
WEST AFRICA	45.1	48.3	40.5	27.7
Benin	45.1	42.6	46.0	52.1
Burkina Faso	54.9	52.4	51.0	38.3
Cape Verde	13.0	13.9	20.2	25.9
Gambia	57.9	60.6	44.5	34.7
Ghana	48.5	46.4	49.5	42.7
Guinea	42.7	33.1	66.7	54.3
Guinea Bissau	51.0	57.8	62.5	57.0
Ivory Coast	49.4	41.2	35.2	29.9
Liberia	30.7	25.5	24.8	31.1
Mali	56.3	46.9	37.7	28.6
Mauritania	56.6	32.1	29.3	19.5
Niger	65.4	64.5	60.4	55.8
Nigeria	62.9	54.4	38.7	22.3
Senegal	34.8	34.3	27.2	17.0
Sierra Leone	39.7	34.8	29.9	27.3
Togo	58.1	49.8	39.6	34.2
CENTRAL AFRICA	41.9	38.3	36.2	30.3
Burundi	75.9	72.5	68.2	63.2
Cameroon, United Republic of	38.4	36.4	33.7	30.8
Central African Republic	48.8	43.9	34.7	40.3
Ghad	55.1	51.1	53.2	58.8
Congo	19.4	15.3	19.6	9.8
Equatorial Guinea	70.6	71.0	66.2	45.2
Gabon	30.8	26.4	17.2	9.4
Rwanda	81.0	76.3	68.6	50.0
Sao Tome & Principe	34.2	37.6	39.9	38.1
Zaire	30.0	21.8	21.1	21.0

Table 1 (Cont'd) - Agriculture in the Economy

Subregion	1960	1965	1970	1983
EAST AND SOUTHERN AFRICA	47.6	42.1	39.5	34.0
Angola	50.0	50.3	44.6	41.4
Botswana	57.6	45.0	42.1	11.7
Comoros	63.0	47.3	44.6	47.8
Djibouti	9.4	7.5	5.1	6.8
Ethiopia	64.7	57.6	54.7	45.9
Kenya	40.0	35.0	35.0	30.5
Lesotho	73.1	65.2	40.8	13.8
Madagascar	40.6	35.4	34.1	33.6
Malawi	57.5	57.2	47.4	42.8
Mauritius	22.4	24.5	24.3	16.4
Mozambique	54.8	48.2	43.5	38.5
Seychelles	14.0	11.1	15.1	9.2
Somalia	44.7	44.4	37.7	29.7
Swaziland	32.4	34.7	32.7	34.5
Tanzania, United Republic of ,	61.1	45.8	41.2	35.7
Uganda	53.0	52.3	55.5	59.8
Zambia	11.4	10.0	12.3	11.9
Zimbabwe	18.6	16.9	15.6	11.6
OTHER DEVELOPING AFRICA	13.0	11.2	8.9	6.6
Namibia	19.1	24.9	15.6	11.7
Reunion	21.1	16.1	10.6	8.4
Western Sahara				
DEVELOPING AFRICA	41.3	36.6	32.0	22.1
SOUTH AFRICA	12.2	10.2	8.1	5.9
TOTAL AFRICA	35.1	30.3	26.5	18.7

Source: ECA Statistics Division.

Developing
Food Production Gro

Table 2

Subregion	Production - Total			
	1965-1969	1965-1979	1975-1979	1975-19
North Africa	5.1	3.5	1.7	(-)1.1
West Africa	2.1	1.3	1.4	1.1
Central Africa	4.5	3.6	1.1	2.2
East & Southern Africa	4.3	2.8	1.5	(-)0.9
Other Developing Africa	5.5	6.3	2.1	1.3
Developing Africa	3.3	2.2	1.3	0.3

Source: ECA Statistics Division

frica
th Rates

			Production - Per Capita			
4	1980-1984	1965-1969	1965-1974	1975-1979	1975-1984	1980-1984
	0.9	2.2	0.6	(-)1.2	(-)1.9	(-)3.8
	1.4	(-)0.3	(-)1.4	(-)1.6	(-)1.6	(-)2.0
	1.6	0.5	0.4	(-)1.4	(-)1.0	(-)0.3
	0.7	2.0	0.1	(-)1.5	(-)2.4	(-)4.1
	0.9	3.1	3.9	(-)0.1	(-)1.1	(-)0.7
	1.1	0.3	(-)0.5	(-)1.6	(-)1.8	(-)2.6

Table 3: Population, Food Production, Demand and GAP

	Population Growth 1975-1984 (Percent) 1/	Agric Popul in popul - 1 (Perc
NORTH AFRICA	2.9	..
Algeria	3.5	..
Egypt	2.3	..
Morocco	3.3	..
Socialist People's Libyan Arab Jamahiriya	3.9	..
Sudan	3.1	76.
Tunisia	2.4	..
WEST AFRICA	3.0	..
Benin	3.1	45.
Burkina Faso	2.4	81.
Cape Verde	1.2	56.
Gambia	2.6	78.
Ghana	3.1	51.
Guinea	2.6	80.
Guinea Bissau	2.6	82.
Ivory Coast	3.9	79.
Liberia	3.2	80.
Mali	2.2	87.
Mauritania	2.9	82.
Niger	2.6	87.
Nigeria	3.2	53.
Senegal	2.6	7[illegible].
Sierra Leone	2.1	65.
Togo	2.4	67.

Developing Africa

ltura tion otal tion 0 ut) 2/	Food Production Growth 1971-1980 (Percent p.a.) 2/	Food Demand 1971-1980 (Percent p.a.) 2/	Food GAP 1971-1980 (Percent) 2/
	...	...	...
	1.3	4.8	-3.5
	1.4	4.5	-3.1
	1.3	3.9	-2.6
	6.9	3.8	3.1
	3.1	3.1	-
	2.3	4.5	-2.2
	...	...	...
	3.0	3.3	-0.3
	2.6	3.0	-0.4
	3.6	3.8	-0.2
	-2.7	4.0	-6.7
	-1.9	2.7	-4.6
	1.5	2.6	-1.1
	1.3	2.7	-1.4
	6.1	4.2	1.9
	2.2	2.9	-0.7
	3.1	3.5	-0.4
	1.6	2.4	-0.8
	5.1	2.6	2.5
	2.5	3.7	-1.2
	...	2.6	-2.6
	1.2	2.2	-1.0
	1.5	2.8	-1.3

Table 3 (Cont'd) - Population, Food Production, Demand of GAP

Subregion	Population Growth 1975-1984 (Percent) 1/	Agricultu Populati in tot populati 1980 (Percent
CENTRAL AFRICA	2.7	...
Burundi	2.6	83.0
Cameroon, United Republic of	2.5	69.7
Central African Republic	2.2	87.3
Chad	2.2	83.6
Congo	2.3	34.2
Equatorial Guinea	2.1	...
Gabon	1.5	76.3
Rwanda	3.1	89.5
Sao Tome and Principe	1.8	...
Zaire	2.4	74.3
EAST AND SOUTHERN AFRICA	3.2	...
Angola	3.6	57.7
Botswana	4.2	80.2
Comoros	3.0	...
Djibouti	2.5	...
Ethiopia	2.6	79.1
Kenya	4.2	77.6
Lesotho	2.4	83.7
Madagascar	2.7	83.3
Malawi	3.0	83.7
Mauritius	1.9	28.2
Mozambique	3.9	64.4
Seychelles	2.6	...
Somalia	3.3	80.0
Swaziland	2.7	72.6
Tanzania, United Republic of	3.2	81.0
Uganda	2.8	80.9

loping Africa

al	Food Production Growth (1971-1980) (Percent p.a.) 2/	Food Demand (1971-1980 (Percent) p.a.)	Food GAP 1971-1980 (Percent) 2/
2/			
	...	...	...
	1.7	2.3	-0.6
	3.0	3.5	-0.5
	1.8	2.1	-0.3
	2.5	-0.2	2.3
	2.0	2.7	-0.7
	...	...	...
	0.4	1.8	-1.4
	4.0	3.7	0.3
	...	...	...
	1.6	2.1	-0.5
	...	...	...
	0.4	-2.9	3.3
	-3.7	6.5	-10.2
	...	...	...
	...	...	...
	1.7	2.4	-0.7
	1.9	5.1	-3.2
	0.5	6.0	-5.5
	1.1	2.1	-1.0
	2.0	4.5	-2.5
	-0.2	3.7	-3.9
	-1.7	0.6	-2.3
	...	...	...
	0.8	6.2	-5.4
	3.2	4.2	-1.0
	3.9	3.5	0.4
	2.0	1.2	0.8

Table 3 (Cont'd) - Population, Food Production, Dep

Subregion	Population Growth 1975-1984 (Percent) 1/	A (I
EAST AND SOUTHERN AFRICA (Cont'd)		
Zambia	3.3	
Zimbabwe	3.4	
OTHER DEVELOPING AFRICA	2.1	
Namibia	2.1	
Reunion	2.0	
Western Sahara	...	
DEVELOPING AFRICA	3.0	
SOUTH AFRICA	...	
TOTAL AFRICA	...	

Source: 1/ ECA Statistics Division
2/ FAO Policy Analysis Division

Developing Africa

nd of GAP

ricultural tribution in total - 1980 rcent) 2/	Food Production Growth 1971-1980 (Percent) (p.a.) 2/	Food Demand (1971-1980) (Percent) p.a. 2/	Food GAP 1971-1980 (Percent) 2/
66.6	2.1	2.0	0.1
58.7	0.2	2.7	-2.5
...	...	...	...
48.5	-1.6	3.8	-5.4
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...

Developing Africa

Table 4: Share of Food Imports in Total Imports
(Percent)

	1965	1970	1975	1980	1982
NORTH AFRICA	25.22	18.89	...	...	20.95
Algeria	23.94	12.74	21.70	20.96	20.38
Egypt	28.32	23.22	35.92	32.39	30.68
Morocco	32.00	20.66	29.61	19.79	...
Socialist People's Libyan Arab Jamahiriya	15.40	25.59	17.13	19.29	16.00
Sudan	22.97	21.27	18.67	25.87	18.60
Tunisia	19.68	27.86	18.72	13.68	14.18
WEST AFRICA	18.25	16.11	...	...	15.67
Benin	24.24	17.82	22.69	26.21	...
Burkina Faso	25.32	20.44	21.17	21.85	25.43
Cape Verde	25.00	42.22	55.57	42.70	36.36
Gambia	20.00	31.68	24.21	26.48	35.05
Ghana	17.61	20.85	13.42	9.76	10.35
Guinea	8.70	8.93	...	...	...
Guinea Bissau	46.67	37.04	31.84	28.63	...
Ivory Coast	21.40	15.90	14.70	20.30	20.14
Liberia	19.64	16.88	13.87	18.89	18.96
Mali	22.22	28.89	27.22	22.69	14.46
Mauritania	22.73	23.41	30.63	...	...
Niger	15,56	14.18	21.61	14.34	16.74
Nigeria	11.00	8.88	9.53	17.05	15.30
Senegal	38.31	28.94	24.70	24.56	24.95
Sierra Leone	25.49	25.51	20.19	...	...
Togo	23.40	23.11	14.19	16.54	27.11
CENTRAL AFRICA	19.26	15.76	...	...	8.81
Burundi	15.00	26.68	16.19	14.10	13.08
Cameroon, United Republic of	11.36	12.23	10.95	8.61	12.20
Central African Republic	12.90	16.94	16.12	20.86	18.18
Chad	13.33	20.63	14.52	16.05	...
Congo	14.29	20.11	16.39	16.18	...
Equatorial Guinea	31.82	32.00	...	...	...
Gabon	15.15	14.26	13.15	19.14	16.65
Rwanda	10.00	19.22	18.98	...	12.59
Sao Tome and Principe ..	33.33	26.31	45.98	...	...
Zaire	24.11	15.68	16.97	20.26	...

Table 4 (Cont'd) - Share of Food Imports in Total Imports
(Percent)

	1965	1970	1975	1980	1982
EAST AND SOUTHERN AFRICA	13.78	11.92	...	...	10.17
Angola	13.53	15.68	...	...	13.91
Botswana	30.77	22.22	...	...	16.16
Comoros	28.57	44.44	49.08	...	34.88
Djibouti	25.00	26.32	31.09	...	10.97
Ethiopia	8.64	9.25	5.01	7.85	9.81
Kenya	12.74	5.92	6.04	7.73	7.74
Lesotho	31.25	31.45	...	...	...
Madagascar	14.08	12.94	8.54	14.09	19.24
Malawi	19.74	18.60	9.41	7.51	10.93
Mauritius	40.00	35.53	26.71	26.45	28.02
Mozambique	12.02	13.49	15.93	...	9.47
Seychelles	50.00	30.00	29.45	20.82	24.14
Somalia	33.33	33.68	26.01	32.49	20.36
Swaziland	14.71	13.33	...	...	9.63
Tanzania, United Republic of .	9.44	6.57	20.02	13.33	9.44
Uganda	7.50	6.57	5.80	...	6.96
Zambia	10.43	10.60	7.76	8.57	7.10
Zimbabwe	16.03	0.85	2.75	2.54	1.82
OTHER DEVELOPING AFRICA	...	...	...	...	...
Namibia	...	30.82	30.79	27.40	...
Reunion	...	...	...	...	...
Western Sahara	19.87	16.06	...	...	16.98
DEVELOPING AFRICA	...	...	...	...	...
SOUTH AFRICA	...	...	...	...	...
TOTAL AFRICA	...	...	...	...	...

Source: ECA Statistica Division

FIG. I

DEVELOPING AFRICA – AFRIQUE EN DEVELOPPEMENT

ANNUAL GROWTH RATE – TAUX DE CROISSANCE ANNUEL

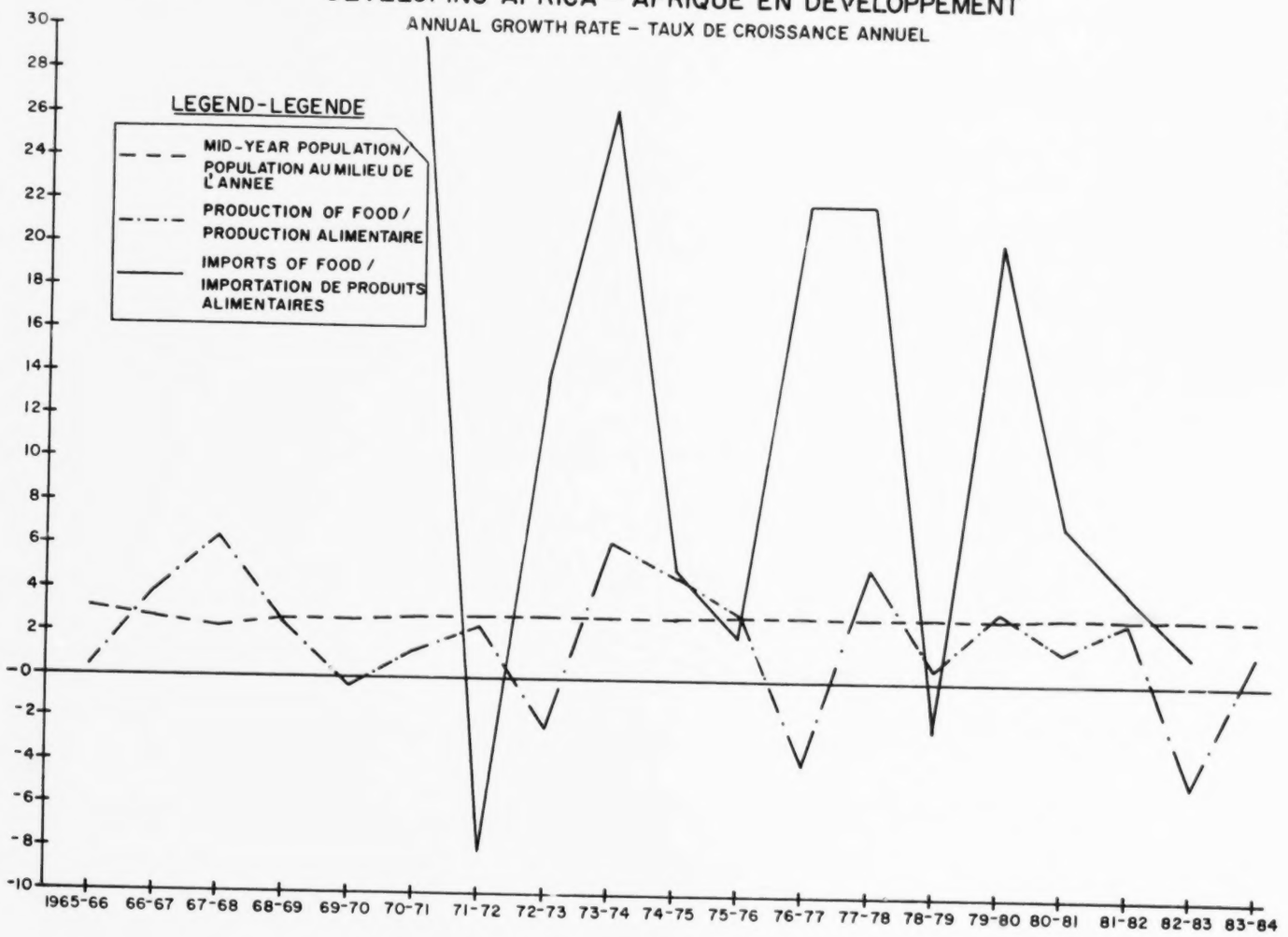


FIG. 2 FOOD PRODUCTION PER CAPITA – PRODUCTION ALIMENTAIRE PAR HABITANT
(GROWTH RATES – TAUX DE CROISSANCE)

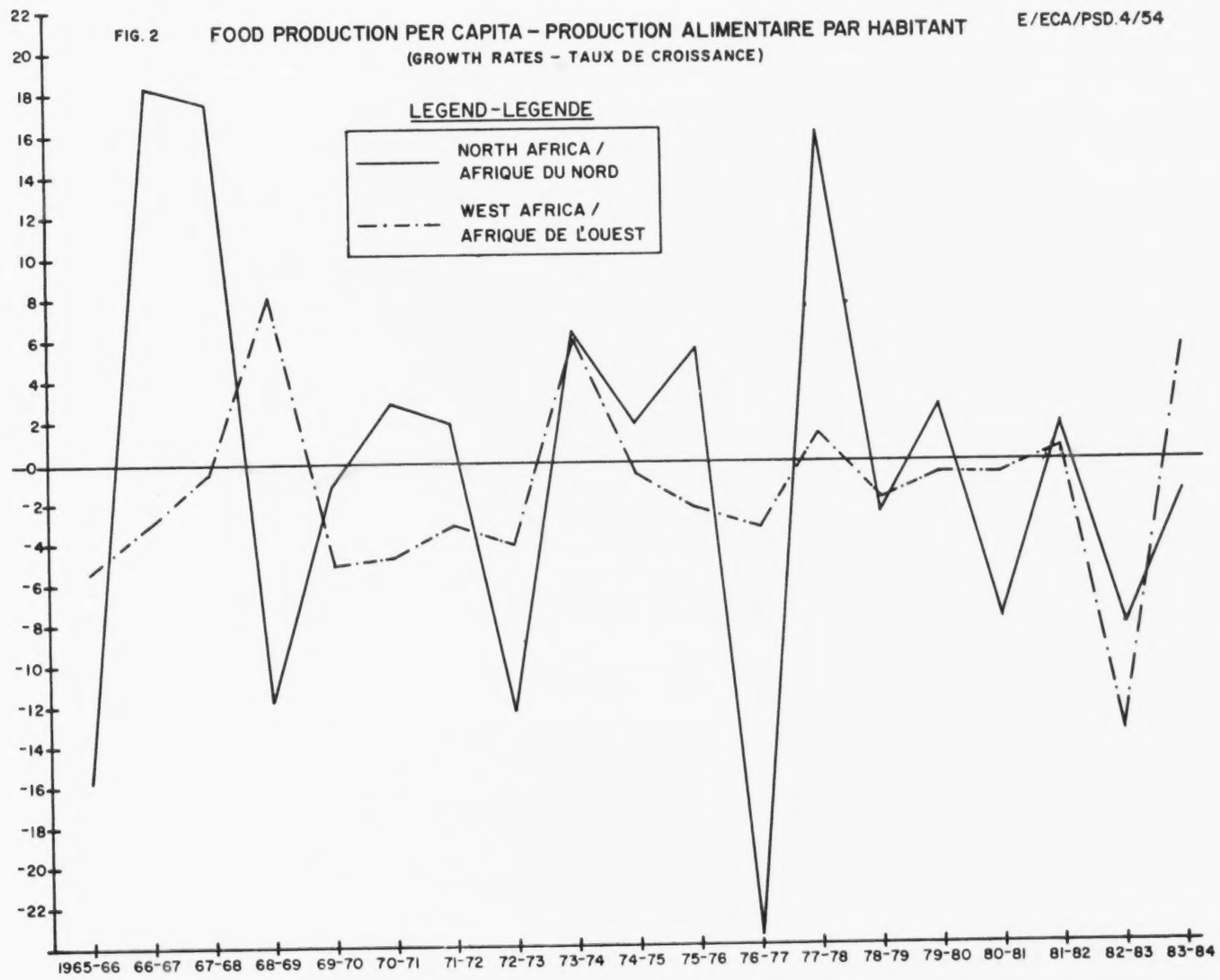
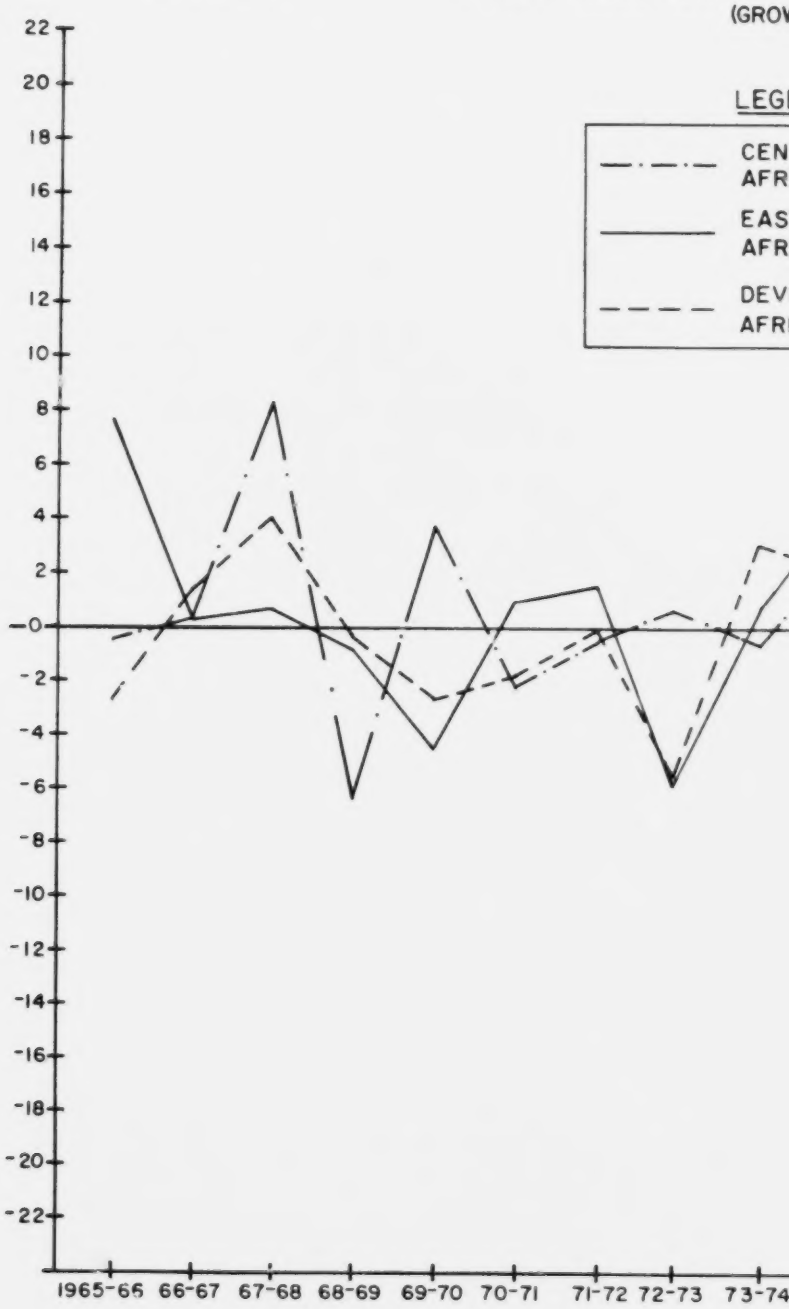


FIG. 2 (Cont.)

FOOD PRODUCTION PER
(GROV



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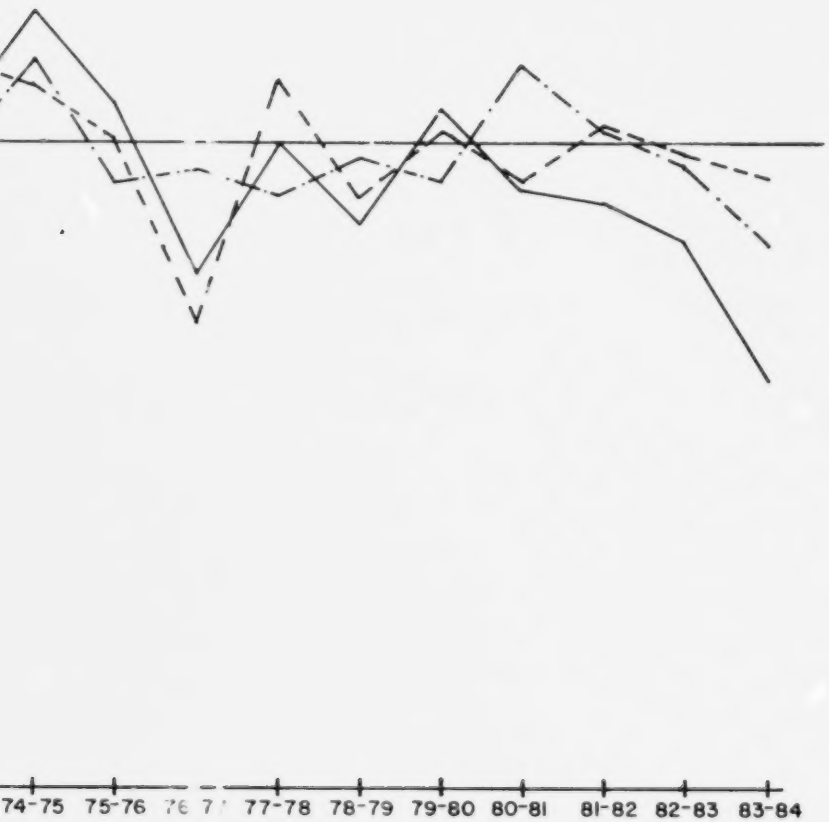
APITA – PRODUCTION ALIMENTAIRE PAR HABITANT
TH RATES – TAUX DE CROISSANCE)

E/ECA/PSD.4/54

ND-LEGENDE

RAL AFRICA /
UE CENTRALE
AND SOUTHERN AFRICA/
UE DE L'EST ET DU SUD
LOPING AFRICA /
UE EN DEVELOPPEMENT



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DEVELOPING AND IMPROVING DISTRIBUTION STATISTICS

E/ECA/PSD.4/55

DEVELOPING AND IMPROVING DISTRIBUTION STATISTICS

Introduction

1. The distributive trades and services sector plays an important part in the economic activity in every African country, both in terms of its contribution to gross domestic product and as a source of employment of labour. In most of these countries there has been a mass exodus of labour from the rural into the urban areas, and much of this labour is taken up in the distributive trade and services sector. In terms of its contribution to gross domestic product, the sector has been growing. From 20.6 per cent in 1970, the sector contributed 23.6 per cent of developing Africa's domestic product in 1984, with an average annual contribution of 22.6 per cent in the period 1970-1984.

2. In spite of its importance as a basis for assessing trends in the economy, designing and evaluating development programmes, and as a target group for fiscal and taxation measures, not much is known about the sector. One reason for this is that the sector's activities are not usually the subject of central attention in a number of African countries. Distributive-trades are widely scattered within a country and perform the very important role of channelling goods from the producer to the consumer.

3. This paper puts forward suggestions for developing and improved statistics of the sector and in particular the collection of data from the small scale and unorganized units within it.

Statistics on distribution

4. According to information available in the secretariat, very few African countries have conducted comprehensive surveys or censuses on distrubution. Countries which have conducted such inquiries have done so on a spasmodic basis and not only is there no regular and systematic flow of data on distributive-trade and services, but also a system or machinery for such data flow simply does not exist in some of the countries.

Scope

5. Activities which fall within the distribution and services sector are defined by ISIC groups as follows.

ISIC group	Activity
6100	Wholesale trade
6200	Retail trade
6310	Restaurants, cafés and other eating and drinking places

ISIC Group	Activity
6320	Hotels, rooming houses, camps and and other lodging places
8310	Real estate
8323	Data processing and tabulating services
8325	Advertising services
8330	Machinery and equipment rental and leasing
9411	Motion picture production
9413	Radio and television broadcasting
9414	Theatrical producers and entertainment services
9511	Repair of foot-wear and other leather goods
9512	Electrical repair shops
9513	Repair of motor vehicles and motorcycles
9514	Watch, clock and jewellery repair
9519	Other repair shops n.e.c.
9520	Laundries, laundry services, and cleaning and dyeing plants
9591	Barber and beauty shops
9592	Photographic studios, including commercial photography

Statistical units

6. The International Recommendations on Statistics of The Distributive Trades and Services 1/ states that "the statistical unit, that is the entity for which the required items of data are gathered should ideally be the establishment or the establishment-type unit " By "establishment" is meant shop, office or any other single location at which a combination of resources and activities is directed by one ownership in carrying out one kind or other of the activities listed above. The establishment may include associated auxiliary units, e.g. subsidiary warehouse, garages and offices in its proximity.

1/ United Nations Statistical Paper's Series M No 57
U.N New York. 1975

Available information indicate that the majority of African countries use the establishment as the basic statistical unit, a few countries use the enterprise instead of the establishment. Most countries treat mixed activities as a single unit classifying them by the main activity on the basis of the proportion of total value of sales.

7. Although the ISIC recommends that activities be classified into wholesale (ISIC 6100) and retail (ISIC 6200), some countries have not been able to make the distinction although they consider it desireable and useful. The reason for this is that not enough data were available. Even in cases where it was possible to make such a distinction, not all the establishments could be classified into ISIC divisions 61 and 62. These establishments are put in a single group covering both wholesale and retail trade. Where wholesale and retail trade establishments are classified separately such classification must be in accordance with the activities carried out by them and be based on the major groups of merchandise sold by these establishments.

8. The following subdivisions are recommended in making such a break-down.

(a) Wholesale trade
- Agricultural raw materials
- Minerals and industrial materials
- Industrial, commercial and agricultural machinery and equipment; motor vehicles
- Hardware and electrical goods
- Furniture and home furnishings
- Textiles and apparel
- Food, beverages and tobacco
- Wholesale trade n.e.c.

(b) Retail trade
- Grocery, wine and liquor stores
- Pharmacies
- Dry goods, apparel and foot-wear stores
- Furnitures and home furnishings stores
- Hardware stores
- Motor vehicles and motorcycles
- Gasolene (petrol) service stations
- Department and variety stores
- Retail trade not elsewhere classified.

9. A number of African countries have practical difficulties in distinguishing wholesale from retail activities as these activities are not infrequently carried on in the same entity and separate data are rarely available for each kind of activity. The ISIC suggested approach is that if each of the various kinds of activity of a given entity is substantial and usually carried on in distinct establishments, then efforts should be made to subdivide it into statistical units which are comparable to the establishment delineated in most instances. In some countries separate data simply do not exist, and the practical solution has been to use the local unit as the statistical unit and the whole entity is put in wholesale and retail trades as one group.

Data to be gathered and published

10. The International Recommendations on Statistics of the Distributive Trades and Services

Sets out the data to be gathered and published by countries beginning to develop, or are in the process of developing, their statistics of the distributive and service trades. (Annex I)

11. Annex II gives a summary view of the data sought by African countries during inquiries on distributive trades. A number of countries conducts census of industrial and distributive-trades statistics, so that data are sought on both subjects during the same inquiry.

12. From Annex II it could be seen that most of the data which are recommended for collection are in fact being collected by countries under some of the following items of data:

(a) Statistical Unit

13. Under this item while it might be easier for countries to limit their coverage of the basic inquiry to establishments which could be easily identified, it would be advantageous to endeavour to include also all units whose activities are not carried out at fixed premises or permanent locations. Examples are hawkers and itinerant traders. They form part of Africa's growing informal sector, although they are in that area of the economy where, not infrequently, no records or accounts are kept. One way of obtaining data on their numbers, etc. is through household surveys. In addition, sample surveys could provide information on their sales, cost of sales, trade margins, etc.

14. As regards location i.e. the place at which the establishment is physically performing its activities, most African countries have identified this item by administrative areas ranging from major divisions or provinces to towns. However, not much attempt has been made to distinguish between economic areas, utilising population density and distribution or geographical pattern of transportation etc.

15. African countries define the size of the establishment primarily in terms of the average number of persons engaged in the establishment during the inquiry period. However, the use of employment figures as the criterion of size necessitates converting part-time workers to their full-time equivalent, particularly in the case of retail trade and services where part-time work is common in the region. In spite of their importance, some countries have not counted family-workers in the number of persons engaged, nor have they attempted to convert part-time workers to their full-time equivalent. Part of the problem lies with family-worker on part-time, some of whom work when they can and for as long as they can, and it is usually difficult to estimate the exact number of hours they have worked. However, where part-time work is common and significant attempt should be made to arrive at some full-time equivalents.

(b) Employment

16. From Annex II it could be seen that all countries collect data on employment i.e total number of persons engaged in a single period of the inquiry. However, not all countries have been able to distinguish between

(i) number of working proprietors
(ii) number of unpaid family workers
(iii) number of employees.

It is recommended that wherever possible, a distinction should be made between (i), (ii) and (iii).

(c) Compensation of employees

17. These items of data are collected by countries with varying degrees of accuracy.

(d) Sales and receipts

18. These items of data are collected by countries with varying degrees of accuracy.

(e) Purchases and other costs.

19. These items of data are collected with varying degrees of accuracy.

(f) Indicators for specific service trades, i.e. restaurants, hotels etc.

20. Not many countries have reported collecting these items of data. While the data might be collected with a high degree of accuracy from registered establishments, a number of these establishments have recently mushroomed in some countries of the African region. Data collected from them are likely to be very unreliable. However, the growth in statistics on tourism will enable improvements to be effected to indicators for specific service trades.

Data Collection-Problems

21. The items of data described above are derived chiefly from the following sources: censuses, establishments which provide and distribute services, sample surveys of trade establishments, censuses of establishments in general, sample surveys of establishments in general, administrative records and specially designed surveys e.g. household surveys. In order to reduce the workload on respondents, especially the small-sized establishments, sample surveys in place of some censuses are recommended. Sample surveys if well planned and carried out could yield good quality data with fewer respondents.

22. The directory of establishments is an indispensable tool for drawing up sample surveys. It is also an important administrative instrument. But a major problems lies with establishing such a directory.

23. The structure of the distribution sector itself is a problem. In the African region, two distinct subsectors in the distributive and service trades can be identified. On the one hand there is the modern sector with an active nucleus centered in the main cities. Although this sector is easily recognized, it is virtually impossible in certain circumstances to distinguish the establishment from the enterprise. The grower may be the processor, and or the vendor as well.

24. On the other hand there are a multitude of small and highly scattered retail shops and outlets supplying their services to rural customers and mostly low-income households in the urban areas. Usually small in size, in aggregate they account for a significant proportion of the goods and services of the distributive-trades sector and its gross margin and value added.

Many small units, e.g. petty traders itinerant traders, barbers, watch repairers, photographers, peddlers, etc. , have no fixed location at which they can be found. Their operations are intermitent or seasonal, often supplementing agricultural or other pursuits. Illegal street trading, a common feature of some African cities is only the tip of the iceberg. Africa's informal sector is growing. Smuggling is part of it. No records or accounts are kept, no taxes or regular wages paid and all transactions are strictly cash, all pervasive, but of crucial economic importance. Coverage is thus likely to be very incomplete, the results obtained meaningless unless exhaustive and expensive census-type activities are carried out to update the directory.

25. Other problems with small retail outlets include their high rate of 'births' and 'deaths' and the level of intelligence of respondents may be a real barrier to communications. In spite of the problems, it is recommended that African countries prepare and put into effect realistic plans for collecting statistical data from the distributive-trades and services sector, particularly from its small unorganized and unregistered units.

26. This is crucial for all developing African countries where small establishments, households and the unorganized sector are making significant contribution to the economy. An accurate head count is likely to reveal Africa's informal sector as one of the biggest sources of jobs even though the question of whether the itinerant trader, peddler, etc, really aid economic development may well be in doubt if one looks at the mass exodus of persons from the rural to the urban areas and its result on Africa's food and agricultural production.

27. Data on the structure and working of the business system particularly the distributive-trades and services sector are essential for accurate estimation of the national accounts, for efficient policy design and planning. Businessmen themselves will benefit in a variety of ways from the data. Distribution statistics will help them to evaluate general economic changes, estimate trends and undertake studies for the identification of potential consumers, etc. and location of markets. As retrenchments and redundancies bite into the number of jobs in the formal sector, so the informal sector swells; more itinerant traders, barbers, watch repairers, and garage proprietors. Statistics on them are needed.

28. Admittedly, the vast number of units engaged in distributive-trades, the absence of complete and reliable directory of such businesses and the fact that so many of them are small units and or family concerns with little inclination to respond quickly or accurately to statistical inquiries are factors which make the collection of statistics in this area an arduous task.

Use of Sampling

29. There are advantages in using sampling techniques in the collection of comprehensive distribution statistics once every five or ten years as well as in monthly, quarterly and annual surveys. Sampling is valuable in gathering data from small establishments, and the set of data recommended to be collected and published by countries beginning to develop, or are in the process of developing, their statistics of the distributive and service trades can be collected in sample surveys. Usually less expensive than censuses, sample surveys if well planned and conducted, yield as good as or even more reliable data than censuses. There are added advantages: the number of respondents in a sample survey is much smaller than in a census, and the returns could be tabulated rapidly and preliminary results published without much time lag, and at reduced cost.

30. However, in conducting sample surveys of distributive-trades and services, care must be taken to ensure that the sample is representative of the population. This will necessitate the use of probability sampling or random sampling. The sample could be designed in such a way that it will yield the required precision at a minimum cost, or conversely, at a fixed cost it will yield estimates of the characteristics desired with the maximum precision possible. A method of selecting a sample often employed in place of random or probability sampling is to choose a sample of establishments which is representative with respect to certain known characteristics of the population. However, in such samples one cannot have an objective measure of the reliability of the sample results because the various establishments may have differing and unknown chances of being in the sample. Although many countries utilize purposive samples, an increasing number are turning to the use of probability samples. Purposive selection is economical for obtaining a sample of given size, both in time and cost, but there is always the possibility that it will lead to faulty results.

31. The large number of retail trade units coupled with high rates of births and deaths make it difficult to maintain a permanent register of them. As already mentioned in this paper, some of these outlets have no fixed location. Each time a census or survey has to be undertaken, a full scale field enumeration has to be undertaken. This is an extremely costly operation, and for this reason it will be to advantage if the census of distribution is timed to coincide with a population census in order that the recording of shop premises, etc. can be done by census of population enumerators.

32. However, some forms of retailing such as mobile shop, street and market trading cannot be covered in this way, because of the itinerant nature of the business, and a variety of sources of information will have to be consulted e.g. records of hawkers' licence holders kept by the police or municipality. In the case of market traders there is a good chance that some data on their numbers could be obtained from the market superintendents' list of daily/ weekly licences issued. However, with itinerant traders the position may be more difficult. These traders may not even be holding permits or licences. Their operations are intermitent or seasonal, coverage is thus likely to be very incomplete.

33. For itinerant business activities as well as family retail trade sampling is the best method of obtaining data. Other sources of data include population censuses, household surveys, municipal and police records. However, the best method of obtaining data on them are through regular sample surveys.

Data to be gathered and published by countries beginning to develop, or in the process of developing, their statistics of the distributive and service trade a/, b/

Item of data	Statistics to be gathered		Statistics to be tabulated according to kind of activity in		Statistics to be tabulated according to size and kind of activity in infrequent inquiries
	Infrequent inquiries	Annual inquiries	Infrequent inquiries	Annual inquiries	
(1)	(2)	(3)	(4)	(5)	(6)
A. Statistical unit					
1. Kind of activity...	1	1			
2. Kind of legal organization and ownership*.....	1				
3. Location*.....	1				
4. Size	1				
5. Number of statistical units.....			1		1
B. Employment					
1. Total number of persons engaged in a single period of the inquiry period	1	1	1	1	
distinguishing:					
a) Number of working proprietors.....	1		1		
b) Number of unpaid family workers..	1		1		
c) Number of employees.....	1	1	1	1	
2. Number of employees engaged in several periods of the inquiry period*....	1	1			

(1)	(2)	(3)	(4)	(5)	(6)
3. Average number of employees engaged in the inquiry period...			1	1	
4. Average number of persons engaged in the inquiry period.....			1		1
C. Compensation of employees					
1. Wages and salaries paid to employees during the inquiry period	1	1	1	1	
D. Sales and receipts					
1. Value of all sales and receipts during the inquiry period.....	1	1	1	1	1
of which:					
a) Sales of goods on own account	1	2	1	2	
b) Commissions received on transactions on account of others	1	2	1	2	
E. Purchases and other costs					
1. Cost of goods purchased intended for sale	1	2	1	2	
F. Gross margin (wholesale and retail)			1	2	
G. Indicators for specific service trades					
1. Number of seats (for restaurants, eating and drinking places, cinemas, theatrical productions and entertainment)	1	2	1	2	

(1)	(2)	(3)	(4)	(5)	(6)
2. Number of rooms (or beds) and occupancy rates (for hotels, motels etc.)	1	2	1	2	
3. Number of admissions (for cinemas, theatrical productions and entertainment)	1	2	1	2	

a/ The recommended scope for the inquiries is wholesale and retail trade, restaurants and hotels (ISIC major division 6) and selected services (parts of ISIC divisions 83, 94 and 95). The recommended statistical unit is the establishment-type unit.

b/ For international purpose, all items of data gathered, except those marked with an asterisk, should be published.

Each item is indicated as of first priority (noted in the annex by "1") or second priority (noted by "2").

Distributive Trades and Industrial Statistics in the African Region

Country	Data sought	Coverage
Algeria	Character of enterprise and its establishments, employment, wages and salaries, expenditure on fixed assets, capacity of installed power equipment, consumption of energy and water, cost and receipts of production, value of stocks (by enterprise questionnaire) and value and quantity of commodities produced and consumed (by establishment questionnaire).	Enterprise with 5 or more employees
Angola	Number of commercial and service establishments, employment and capital.	All establishments
Botswana	Hotel occupancy, employment, earnings, value added, capital formation.	All enterprises
Burundi	Employment, wages and salaries, turnover value of inputs and investment in fixed assets.	Enterprises in Bujumbura
Central African Republic	Employment, wages and salaries, inventories, purchases, production and sales.	....
Chad	Employment, wages and salaries, purchases of raw materials, value of production, stocks and investment.	
Congo	Employment, investment, energy consumption, wages and salaries, purchases and sales	1966 - All enterprises 1973 - enterprises with annual turnover of 40 million Francs and over.
Egypt	Employment, wages and salaries, capital, quantity and value of production.	All establishments
Ethiopia	Number of establishments, and average number of persons engaged, wages and salaries, industrial and non-industrial costs, expenditure on fixed assets, inventories, investment taxes and gross output.	All establishments in urban areas
Gabon	Characteristics of establishment and enterprise, taxes, investment, employment, wages and salaries, production.	All enterprises including handicraft

Country	Data sought	Coverage
Ghana	Characteristics of establishment, employment, turnover, expenditures, current assets, domestic sales and stocks of imported commodities.	1952-1966 All enterprises. Conducted in association with industrial statistics annual survey. Since 1967, establishments with annual turnover of 20,000 Cedis and more
Kenya	Type of organization, labour costs, purchases and stock of goods, other current costs, sales and capital assets.	For 1960 and 1966 establishment with one or more paid employees and with a turnover of over £1000. For 1971 all establishments on the labour enumeration master file
Lesotho	Employment, earnings.	Large establishments in the private sector.
Liberia	Employment, wages and salaries, intermediate consumption, goods purchased, fixed assets stocks.	Private establishments with 20 or more employees
Madagascar	Employment, cost of purchases, electricity consumed, wages and salaries.	All establishments
Malawi	Employment, wages and salaries, value of materials and fuel consumed, value of stocks and capital assets payments for services.	Prior to 1974, establishments with 20 or more workers. Beginning 1974, establishments with annual turnover of 100 thousand Kwacha or more for ISIC groups 71 and 95 and 500 thousand Kwacha or more for ISIC group 6 and 8.
Mali	Employment, wages and salaries, cost of inputs, value of outputs, stock, turnover.	Enterprises with annual turnover of 10 million Francs or more

Country	Data sought	Coverage
Mauritania	Employment, wages and salaries, cost of purchases and sales.	Enterprises with annual turnover of 10 million Francs or more
Mauritius	Employment, wages and salaries, purchases, sales.	All establishments
Niger	Employment, wages and salaries, purchases, sales, stocks, number of hotel occupancy, seating capacity (theatre), etc.	All establishments
Nigeria	Employment, wages and salaries, gross output, gross cost of goods and services sold, operating costs, operating receipts, inventories.	Private establishment engaging 10 or more persons
Senegal	Employment, wages, salaries, cost of production, sales, stock etc.	For 1974 all establishments except handicrafts, For 1975, 500 most important enterprises
Sierra Leone	Employment, wages and salaries, cost of production, sales, stock, etc.	Establishments with 6 or more workers
Sudan	Employment, renumeration of employees, sales, cost of sales.	All establishments including restaurants and hotels.
Swaziland	Employment, wages and salaries, operating surplus, depreciation, indirect taxes, intermediate consumption, capital formation.	For ISIC 61 and 62. Complete enumeration of establishments employing 50 or more persons, 50 per cent sample of establishments employing 10-49 persons and 10 per cent sample of establishments employing less than 10 persons. For ISIC 63 complete enumeration of establishments employing 50 or more persons and and 50 per cent sample of establishments employing less than 50 persons.

Country	Data sought	Coverage
Togo	Employment, wages and salaries, value of gross output and value of inputs.	All enterprises except handicraft
Tunisia	Employment, wages and salaries, investment cost of sales, sales.	All establishments
Uganda	Employment, labour costs (in cash and in kind) receipts from sales, commissions, operating costs, value of stocks, purchases etc.	All enterprises
United Rep of Cameroon	Employment, wages and salaries, turnover.	All enterprises
United Rep. of Tanzania	Employment, wages and salaries, purchases, sales, inventories, fixed assets, etc.	All enterprises
Zaire	Employment, wages and salaries, turnover, purchases, stocks, investment and intermediate consumption.	For production sector, all enterprises operating on the basis of modern accounting system. For commerical sector, enterprise with a turnover of 50 thousand Zaires or more
Zambia	Sales and purchases, stocks, employment and wages and salaries.	All large and medium enterprises and a sample of those with less than 20 employees
Zimbabwe	Characteristics of establishment, sales, receipts from services, purchases, stocks, wages and salaries, sales by commodity groups, creditors and debtors.	All establishments except those whose sales of home produced goods exceeds 50 per cent of total turnover

Source: National Publications and Bibliography of Industrial and Distribution Trade Statistics. United Nations, Statistical Papers Series M. No. 56 Rev. 5.

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REPORT OF THE TRAINING WORKSHOP ON NATIONAL ACCOUNTS FOR THE ENGLISH-SPEAKING AFRICAN COUNTRIES

(Addis Ababa, 30 September - 11 October 1985)

TRAINING WORKSHOP ON NATIONAL ACCOUNTS

REPORT

1. INTRODUCTION

1.1 The course was organized under the UNDP/ECA Project RAF/78/061, "Assistance in National Accounts to LDC's and NIC's", with the objective of promoting understanding of the concepts, methods and data requirements for the compilation of national accounts estimates. It was intended for participants responsible for national accounting work in the countries of the African Region.

1.2 In view of lack of funds for simultaneous interpretation it was decided to conduct two parallel workshops, one for French-speaking participants and one for English-speaking participants. This report deals with the English-speaking group. Because of the nature of the workshop, which was very informal and in the nature of a training course, the report does not attempt to summarize the proceedings. It does however cover organizational aspects as well as evaluation by the participants.

2. ORGANIZATION AND ATTENDANCE

2.1 Invitations were sent to countries in May 1985 seeking nominations for participation in the course. It was stated that the ECA could not provide any funds for the participation of nominees and that such costs would have to be met by countries, e.g., through local UNDP programmes.

2.2 Some 14 nominations were received from English-speaking countries, but many had to withdraw for lack of funds or other reasons. In the end there were eight participants. Two of the participants, from Zambia and from Zanzibar, were so limited that only these two and one French-speaking participant could be sponsored in this way.

2.3 Despite the despatch of letters at the end of July asking for information on the funding of nominees, very few replies were received and one week before the start of the workshop it was still not clear how many participants would arrive in Addis. This made it difficult for proper arrangements to be made for hotel accommodation etc, which nonetheless seemed to work out reasonably well.

3. STAFFING

3.1 After the arrival of the Regional Advisor at ECA in July 1985 it was agreed that he would bear the main responsibility for the conduct of the English-speaking workshop. The Chief of the General Economic Statistics Section

of ECA Statistics Division led two of the sessions, (a) on particular problems of estimation and the adaptation of the SNA to developing countries, and (b) the review of the SNA. An attempt was made to obtain the services of an ECA economist to describe some of the uses of the SNA, but this proved not to be possible. (The francophone group was led by a staff member of the ECA Statistics Division together with the Senior Regional Adviser from the UN Statistical Office, New York).

3.2 Running a two-week workshop almost single-handed was a considerable task, especially for someone new to the job. Despite this, the objectives of the workshop seemed to have been achieved (see evaluation below). However, on future occasions it would be desirable to have more support in a workshop of such duration especially if the number of participants is larger. One participant suggested that there should have been guest speakers from other organizations such as FAO and ILO to explain how to make estimates covering their particular fields.

4. DOCUMENTATION AND EQUIPMENT

4.1 At the previous workshop in Rabat in 1980 extensive documentation (some 25 papers) was prepared and distributed to the participants. Rather than to update and revise these it was agreed that such extensive documentation of this type was not needed, especially if participants had copies of the SNA in front of them.

4.2 Accordingly, a cable was sent to New York (reference STS/463) on 19 July requesting that copies of the SNA should be sent to Addis. Unfortunately these did not arrive. This meant that there was virtually no documentation available at the workshop.

4.3 However, the Regional Adviser prepared a number of practical exercises which were intended to illustrate various aspects of national accounts estimation.

4.4 A number of calculators were obtained for use by the workshop. These were charged to the project. The adviser is grateful to the British Council for the loan of a roll of transparent film (for use with an overhead projector). The British Council also loaned two short 16 mm management training films which were shown to the participants.

5. CONTENT OF THE WORKSHOP

5.1 The draft programme for the workshop is attached as an Annex. This programme was followed quite closely, although it was found that the numerical

exercises were fairly time consuming. This sometimes meant that there was less time for discussion than desirable. However, the use of exercises was believed by the adviser to have a much greater practical impact on the participants than mere theoretical discussion.

5.2 The time allowed for the preparation of proposals for data collection was more than enough. The following papers were prepared and typed by the secretariat so that participants could take them back to their countries.

(a) Proposals for the collection of data on private final consumption expenditure (Libya).

(b) National accounts compilation (Mozambique).

(c) Collection of prices of construction materials (Tanzania, Mainland).

(d) A monthly survey of fishing (Zanzibar, Tanzania).

(e) Survey of employment and earnings in the Private Service Sector (Uganda).

(f) Proposal for data collection on the banking industry (Uganda).

(g) Improving the response rate of the national income inquiry (Zambia).

It is hoped that some of these proposals (suitably amended) will be implemented by the respective countries.

6. POINTS ARISING FROM THE DISCUSSIONS

6.1 One of the major problems facing the national accounts statisticians was often the lack of local understanding (on the part of Ministries of Planning and of Finance) of how to use the national accounts statistics. The Chief of the ECA Statistics Division indicated that this problem was well known and had been discussed in other contexts; he said that often economists in English-speaking Africa (unlike their French-speaking counterparts) did not have the necessary background or training in the analytical use of statistics. Participants suggested that the education of users was most necessary and that a series of practical workshops for such people should be organized. Too often, statisticians felt that their product was not appreciated, and were reduced merely to satisfying certain international requirements.

6.2 Thanks to the presentation by the Chief, GESS, participants were made very aware of the importance of the review of the SNA which is currently in progress and which is scheduled for completion in 1990. The review was

being undertaken with the needs of developing countries very much in mind and it was therefore vital that countries in the African region participate fully in shaping any proposals. He said that reponse to the letter sent out by ECA in May 1984 asking countries to comment on the SNA had been disappointing.

6.3 Although aware of the need, the participants present were reluctant to commit themselves to producing any papers on this subject. Some delegates felt they did not have sufficient experience to do this. Some suggested that it was difficult to develop new ideas in isolation and that the ECA secretariat should prepare proposals upon which countries could be invited to comment or develop further. It was stated that the secretariat would be preparing a paper in any event, but that without the first hand experiences of the countries in the region this would be of limited value. It was agreed that the secretariat should write again to countries urging them to participate.

7. EVALUATION

7.1 Participants were invited to complete a questionnaire.

7.2 On the whole the participants were clearly satisfied with the course. It was a little surprising that two participants thought that the workshop should be even more practical, given the number of practical exercises that were included.

7.3 The exercises were designed to introduce a wide range of topics. Four of them specifically covered problems of estimation of the value added by certain activities. However concentration on these problems meant that some types of activity were hardly discussed at all, and at least one participant would have preferred to take each sector in turn. (Time was allowed however for discussion of particular points which participants wanted to raise.)

7.4 Despite an almost total lack of documentation half the respondants thought it was sufficient. (No-one thought there was more than enough.) The publication of the new handbook entitled "Accounting for production" will provide an excellent textbook for this type of workshop. When asked if he had over referred to the 25 documents provided at Rabat in 1980, a participant who had attendei that workshop replied that he had not. This type of documentation does not therefore seem to add greatly to the value of such workshops unless it deals with specific points not covered elsewhere. It is necessary however to make better use of existing UN publications, most of which are excellent.

7.5 Every respondent considered that the objectives of the course had been fully achieved.

8. CONCLUSION AND RECOMMENDATIONS

8.1 Although no formal recommendations were made by the participants, the adviser suggests that the following conclusions and recommendations could be drawn as a result of the workshop.

(a) Courses for users of national accounts

8.2 As noted in paragraph 6.1, it seems necessary to promote a better understanding, on the part of officials in both planning Departments and Ministries of Finance, of the analytical uses to which the national accounts may be put. Compilers generally are not familiar with such techniques; economic analysis is not, after all, their primary task. There is a need therefore for a programme to develop countries' capability to make use of economic statistics for policy analysis and decision-making.

(b) Future workshops in national accounts

8.3 National Accounting is a specialism which calls for the highest qualities among statisticians. It has been described as an art rather than a science. This is because it is necessary to use the utmost ingenuity in compiling accounts often from little or no basic data. Designing a sample survey is a scientific activity; putting together a complete and plausible set of national accounts is quite different.

8.4 Because of its special character and its particular sets of conventions definitions and classifications, it is most desirable for national accountant to meet together on a regular basis to discuss common experience and problems, as part of the process of building up expertise, competence and authority among national staff. A workshop or meeting at least every two years is therefore strongly recommended.

(c) Review of the SNA

8.5 As has been noted above it is difficult for countries to consider what changes might be made to the SNA in isolation. It is recommended that any further request to countries for their views should be accompanied by:

(i) background information describing in some detail the scope of the review and progress to date, including any general proposals which the UNSO may have formulated.

(ii) some specific proposals which may be compiled as a result of knowledge of African conditions in ECA and of views obtained at the inter-regional workshop in Mexico.

8.6 It must be recognized that the ability of individual countries to make definite proposals is very limited: they usually have more urgent priorities at home. It is suggested therefore that the ECA should take the lead in formulating proposals on which countries may comment.

E/ECA/PSD.6/56
Annex

TRAINING WORKSHOP IN NATIONAL ACCOUNTS

PROGRAMME

(English-speaking group)

Monday 30 September 1965

Morning: 0900 - 1230

Registration of participants
Opening address
Presentation of the programme

Afternoon: 1430 - 1700

1. THE SYSTEM OF NATIONAL ACCOUNTS

1.1 Objectives, uses and scope
1.2 General principles

Tuesday 1 October

Morning: 0900 - 1230

1.2 General principles (continued)

Afternoon: 1430 - 1700

1.3 Country experience and plans

Wednesday 2 October

Morning: 0900 - 1230

2. PRODUCTION ACCOUNTS - Sources and methods

2.1 Agriculture
2.2 Industries
2.3 Government

Afternoon: 0430 - 1700

2.4 Services

Thursday 3 October

Morning: 0900 - 1230

3. EXPENDITURES ON GDP

3.1 Government final consumption
3.2 Capital formation
3.3 Private consumption

Afternoon: 1430 - 1700

4. COMMODITY FLOW ACCOUNTS

4.1 Introduction
4.2 Practical exercise

Friday 4 October

Morning: 0900 - 1230

4.3 General discussion

Afternoon: 1430 - 1700

5. PROPOSALS FOR DATA COLLECTION

5.1 Framework for proposal

Monday 7 October

Morning: 0900 - 1230

5.2 Introduction, background and justification

Afternoon: 1430 - 1700

5.3 Method

Tuesday 8 October

Morning: 0900 - 1230

5.4 Timetable and costs

Afternoon: 1430 - 1700

5.5 Completion of proposal

Wednesday 9 October

Morning: 0900 - 1230

6. NATIONAL ACCOUNTS AT CONSTANT PRICES

6.1 Some issues: real product and real income
6.2 Purchasing power parities

Afternoon: 1430 - 1700

7. INCOME/OUTLAY AND CAPITAL FINANCE ACCOUNTS

7.1 Sources and methods
7.2 Presentation of results

Thursday 10 October

Morning: 0900 - 1230

8. DISSEMINATING THE RESULTS

8.1 Methods and importance
8.2 Timetables

Afternoon : Free

Friday 11 October

Morning: 0900 - 1230

9. CONCLUSION

9.1 Implications for revision to SNA
9.2 Evaluation of the workshop.

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LC/NAIROBI.

ADJUSTMENT OF ERRORS IN THE REPORTED AGE-SEX DATA FROM AFRICAN CENSUSES

C O N T E N T S

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I. INTRODUCTION

1. Population is central in the planning process. Not only do we need the size of a population, but also its age-sex structure because errors in these parameters could lead to faulty planning. For example, the health needs are very much different for a young than for an old population. In estimating the needs of a population in regard to education, health, labour force, housing and food, the planner and policy maker will have to depend on pertinent population statistics classified by age and sex. Besides, the demographic and socio-economic situation of a country is determined by its age-sex structure. The effect of age-sex composition on the fertility of a population is also obvious; only women in the childbearing ages of 10 and 54 can contribute to fertility. Many demographic socio-economic attributes are sex specific. Data classified by sex not only have analytical importance, they could also be used as evaluative tools and sex classification is essential in certain situations because of biological differences. Migration also is age-sex selective. Since participation rates in education and economic activity may also vary between age and sex groups, the age-sex structure of a population is important in the study of these important aspects.

2. Although the knowledge of the size, composition, dynamics and distribution of a population is essential for planning, changes in these parameters over time and space are also pertinent. In this regard, if the age-sex data at a base period is subjected to errors and deficiencies, then any projection will not only carry forward these deficiencies, but would also be affected by the effects of such errors which will show up in estimation of births, deaths and migration.

3. The majority of the ECA member States lack direct information on levels and trends of fertility, mortality and migration; data on age-sex composition of the population are mostly utilized to estimate these parameters. With some of the indirect methods of fertility and mortality estimation, the effects of age-sex errors on the resultant parameters are quite large and can vitiate conclusions.

4. Thus the need to have accurate age-sex information of a population need not be over-emphasized. There are two ways of improving the age-sex data. The first one is direct and involves measures to ensure better quality information from the field. Use of aids like historical calendars and documents are some of the techniques available. The other way is to adjust the collected data by various techniques. This paper will address itself mostly to the various adjustment techniques of errors in reported age-sex data; but mention will be made of how and why errors occur in reported age-sex data so that the data collection agency in the member States could plan strategies to counteract the problems and ensure improved age-sex data.

II. COLLECTION OF DATA ON AGE AND SEX

5. The measurement of age has several problems. Information on age can be collected in completed years or in ages nearest to next birthday. The question can be asked; what is a year? To one who is familiar with the western concept of age, it connotes a solar year. But to a Muslim, it means a lunar year; and, to a Chinese it may refer to the traditional calendar. To yet others, it may be quite different from all these.

Similar problems arise regarding the meaning of a birthday. Very few people in the member States celebrate birthdays as relatively little importance is put on the event. Even though there are tremendous variations in age reckoning among societies, it is possible to convert (approximately) age in one system tothat in another. Thus the real problem in age estimation is not the different systems adopted, it is ignorance or indifference as to when a person is born. Deliberate misstatements of age due to one reason or the other, is yet another dimension and this could create problems.

6. When ages are not known to respondents, they are estimated either by them or by others (including the enumerator). The first approximation is to put persons into one of the appropriate decennial groups; thus a large number of people are reported as aged 10, 20, 30, ... years. When efforts are made to estimate age more closely then the mid-point of the range is used and this culminates in persons being reported as aged 15, 25, 35, ... years. Thus digits 0 and 5 become preferred digits in that order. Furthermore, approximation within five year ranges brings in reported ages ending in digits 2 and 8 with minor peaks at 4 and 6. This is also brought about by avoidance of odd digits and preference for even digits. This kind of digit preference or age heaping has been observed in most member States. However, the tempo of age heaping varies over the age range and becomes more and more at the advanced ages so much so that very few people are reported at ages other than 60, 70, 80, etc. In Sudan, for instance, at the 1973 census, around 50 per cent of persons were reported with ages ending in 0 and 5 as against 60 per cent in the age group 60-69.

7. In spite of all efforts to estimate ages using historical or other calendar of events, physical appearance, physiological changes, social customs like circumcision and age grading, documents (e.g. civil and resident registration), it is still possible that a large number of cases remain where age estimation is impossible. As long as the resulting age not stated or unknown group is not large (less than 2 per cent) there is not much of a problem; in most cases prorata allocation may suffice. If other information are available to allocate these into specific age groups, then this could be used. Cold and hot deck methods of imputation are well known. But imputation may create problems in data analysis, interpretation and utilisation and hence should be avoided as much as possible.

8. One of the commonest observations in the reported ages of the member States is the relative shortage of infants and children in enumeration. Deliberate omission, misunderstanding of the scope of enumeration and age estimation error could be possible reasons. Some duplication could result from de jure counting in extended family systems.

9. Even though the definition and classification of sex are easy and sex is generally ascertainable, still field data have their due share of problems arising from misclassification of data by sex. There are several reasons why one sex of the other is either misreported, wrongly reported or not fully reported or even over-reported. At certain ages, the reporting errors could be sex spedific. For instance, omission of infants and children could different from one sex to another. Whereas omission of male children have been noted in most member States due perhaps to fear of "evil eye", the opposite could happen if female children are not considered important to be reported. Ignorance could play an important part in these. Again, reporting of age of males and females differs when they reach puberty and post puberty ages.

Young unmarried girls usually are reported as younger and those married and/or have children are reported as older, but with a noted tendency to be within the reproductive age. For males the tendency is to exaggerate age of adults. Deficit of males in the reproductive ages could also be the result of their mobility, migration or work status. Whereas some omission of girls of marriageable age have been reported among Muslim or Arab-influenced populations, omission of adult males in the past were mostly due to imposition of hut tax and military conscription.

10. In addition to reporting errors, there are instances where recording errors have been detected. A common observation has been non-recording of the sex of a person probably because to the enumerator, the name would automatically suggest the sex. There is also the problem of legibility in writing. For instance, numerals like 1 and 2, unless written with care, may get distorted at the further processing stage. When ages of infants are to be reported in months, this should be clearly marked, as otherwise a 9-month old child may be recorded as 9 years old, and vice versa. No blanks should be left in the questionnaire. In this connection there is need to ensure that after the data has been brought from the field, further errors and biases are not introduced at the processing, analysis and publication stages; all coding should be verified to ensure error free data.

III. QUALITY OF AGE-SEX DATA

11. In the 1980 round of censuses, available information indicates that many of the member States endeavoured to collect age data in single years of age. This represents some improvement over the earlier practice of using such broad age groupings as infants, young children, adults and old persons. The percentage reported as 'age not stated' is also low. But these do not imply that automatically the quality of the data has improved or that people have acquired better information about their ages. Of course the scope of the data collected by these States has improved but the data quality is still relatively poor.

12. An accurate enumeration of the population classified by age involves many difficulties. In general inadequacies in age statistics arise from two basic sources - failure to report ages and deliberate misstatements of ages. The latter may arise from ignorance of the correct age; a tendency to understate at some ages while exaggerating at others - particularly at the more advanced ages; either a conscious or subconscious preference for certain socially significant ages and a corresponding avoidance of other ages; a general tendancy to over-select ages ending in certain digits and, deliberate falsification of age reports for a variety of social, economic, political or purely individual motives. Thus in the reporting of age from censuses there arise five major forms of content errors and biases. These are the under-reporting of the number of the children aged under one; a tendency to give exact age of some legal significance (e.g. voting at elections, marriage, etc.); distinct overstatement of age among those at very advanced ages; the reporting of some individuals as being of an unknown age; age heaping. 1/

1/ Myers, R.J., "Accuracy of age reporting in the 1950 United States Census", (JASA, 1954), vol. 49, pp. 826-31.

13. There are several methods of appraising the quality of age-sex data. It is pertinent to observe at this point that the types of adjustment techniques used should be related to the data quality. A detailed appraisal of these various techniques has been undertaken in an earlier work. 2/ This paper will focus on two of the indices used to detect errors in age heaping. The two indices are those by Myers for evaluation of single years age-sex data and that by the United Nations (i.e. the Joint Score Index) for evaluation of 5 years age-sex data. Based on the joint score index, a quality rating is inferred. The reported age-sex data for a member State is presumed accurate if the joint score index is between zero and twenty; inaccurate if the score is between 20 and 40; and, highly inaccurate if the score is above 40. These are denoted by symbols A, B and C respectively.

14. Table 1 presents data on both indices for 39 member States with pertinent age-sex data from the most recent census. Only one member State (Algeria) fell into the A grade category while 12 had scores of at least 60 implying very poor data. However, from the joint score index computed at two points in time for four of the member States (Table 2), this quality is improving.

IV. ADJUSTMENT OF AGE-SEX DATA

15. In deciding on the adjustment procedure to be adopted in any particular case, some basic principles should be kept in mind. Any adjustment of the data should take care of the peculiarities in the data so that these are not submerged under ad hoc adjustment techniques. Moreover, the adjusted data should not only be smooth, it should also be consistent with the demographic, socio-economic realities of the country both in the past and at the point of time in question. Moreover, adjustment should also ensure smoothness in three directions - vertical (age ratios), horizontal (sex ratios) and diagonal (survival ratios). This means that the consecutive age-sex groups and survival ratios should all be within the realm of possibilities. It is equally important to keep the adjustment to the minimum and in particular, to ensure that the procedures adopted are consistent with the types, varieties and magnitudes of the observed errors and deficiencies.

(i) Mathematical Methods

16. Early in the course of developing procedures for adjusting errors in reported age-sex data, the United Nations proposed differential methods for adjusting the errors in the age groups 0-4, 5-9, 10-74 and 75+. 3/ As advances were made in

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2/ ECA, "Analytical techniques for content error evaluation", in Statistical Bulletin for Africa No. 14, E/CN.14/SIB/14, pp. 79-117.

3/ For details of the methods see Method for Population Projections by Sex and Age, Manual 3 (United Nations, 1956), pp. 11-14.

demographic techniques, mathematical formulae were developed for handling the problem. These techniques included the Carrier-Farrag ratio, Newton's formula and Osculatory graduation method; an outline of their description4/ is presented in Annex 1.

17. The application of these mathematical formulae in varying circumstances has led to the general conclusion that none of the methods is fool proof. In particular, the United Nations approach can be labourious in a situation where the analyst has to deal with data for many member States. Besides, the 5-point moving average method used in smoothing errors in ages 10-74 by the United Nations method as well as the mathematical formulae by Newton, Carrier-Farrag and Osculatory graduation simply redistribute the population in a smooth fashion without taking account of the demographic nature of the data. Therefore, if the observed distortions in the age distribution at a particular point in time reflect unique historical demographic trends, by simply smoothing the observed age distribution, these mathematical approaches do not take the nuances of the data into consideration.

18. Besides, the types and magnitude of the errors and biases may not be the same or even similar from one age group to the next or between two sex groups or even over a time period. Thus one mathematical formula might compromise some of the nuances in the data and at the most, ensure vertical consistency (age ratios). Horizontal smoothness (sex ratios) and diagonal consistency (survival ratios) might not be embedded in these smoothing procedures.

19. Tables 3 to 7 present the adjusted age-sex distributions using the Carrier-Farrag, Newton's quadratic and Sprague osculatory methods for Morocco (1971), Ghana (1970), United Republic of Cameroon (1976), Kenya (1969) and Lesotho (1976). As it is obvious from these data, all these methods at the most can tackle only the population aged 10-69 but not the very young (0-4) and old persons (70+), where the errors and biases are more pronounced and especially at the young ages where the need for adjustment is more pressing than at other ages.

20. As noted earlier, the United Nations in their very early attempts at adjustment of data, recommended special methods to adjust the very young and older ages. For the children aged 0-4 years, the United Nations method suggested is based on the "reverse survival ratio method" by which the child population is projected backwards for five years to derive the implied birth rate and verify whether the two are consistent (i.e. the projected population 0-4 and the associated level of fertility).

21. In one version of the method, the entire population is reverse survived using an appropriate life table for the past two five-year periods. The estimated births are converted into sex-age adjusted birth rates and compared with each other and with expected values. Adjustment is then carried out on ages 0-4 and 5-9 to reflect the fertility levels. This method is less affected by errors in the selection of life tables and is preferred in cases where natural increase is the predominant factor of population growth. But when migration might have played a part in population change, then only the first two five-year age groups are projected backwards and the entire population is reversed for five or ten years by applying appropriate growth rates.

22. For adjusting the population at older ages, the practice is to compare the total proportion at ages 70 years and above with a model stationary population; the model percentages at five-year groups are read off and used to adjust the observed total. If age exaggeration occurs at earlier ages, then it is advisable to consider ages 60-64, 65 and above; if some idea of the fertility and mortality conditions is known, then a model stable population is preferable to a stationary population.

4/ See Carrier, D.H. and Farrag, A.M., "The reduction of errors in census population for statistically underdeveloped countries", Population Studies (March, 1959), pp.240-285.

(ii) Demographic methods

23. The need to take account of the nuances in the data led to the application of analytical techniques such as demographic models whereby the age-sex distribution of the population in question is assumed to fit an appropriate population model selected on the basis of associated demographic parameters and other relevant information.5/ There are several models to choose from including the United Nations model, the Coale-Demeny West/North/South/East models, the Brass logit and Lederman systems. Recently, the United Nations published a family of model life tables and stable populations which it designates as - Latin American, Chilean, South Asian, Far Eastern and general patterns. African data was rarely used in the derivation of most of these. From experience it has been suggested that sub-Saharan Africa is near the North model of Coale-Demeny and North African countries are near the South model.6/

24. The selection of a model may not be the best solution to a particular situation and adjustment of the data might be based on some modification of the above procedure. For instance, the model may be accepted for certain portions of the age-sex distribution and other portions may be adjusted by ad hoc methods which take special care of the peculiarities of the data on hand as is the case with the United Nations method described earlier. Since demographic parameters might undergo some change over time, the use of quasi-stable population models might be recommended in such instances. Equally, because the stable or quasi-stable population might not reflect some of the nuances in the data of a member State at a particular point in time, a combination of model population and mathematical methods has been suggested by Brass.

25. In his logit difference method, to obtain an adjusted age-sex (in five-year groups) population distribution from that reported in a census, he proposes the fitting of a straight line to the logit of differences between the reported age distribution and that of a reference standard. The intercept (a) and the gradient (b) of the fitted lines can be derived by using the relation.

$$\text{logit } P_o(x) = a + b \text{ logit } P_s(x) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where $P_o(x)$ = reported percentage values at age x,

$P_s(x)$ = reference standard percentage at age x.

5/ United Nations, Methods of estimating basic demographic measures from incomplete data, (United Nations, New York, 1967), pp. 17-27.

6/ Clairin, R., "The assessment of infant and child mortality rates from different sources", in the Population of Tropical Africa (Eds. Caldwell, J.C. and Okonjo, C.), Longmans (1968). See also Ekanem, I.I. and Som, R.K., "Problems of choosing model life tables for African countries"; GENUS, vol. XL-niv-2(1984), pp. 57-70.

In order to solve for the values of a and b in (1), use can be made of the following normal equations:

$$\sum_1 {}_1P_o(x) = an + b \sum_1 {}_1P_s(x) \quad \ldots\ldots(2)$$

and $$\sum_2 {}_2P_o(x) = an + b \sum_2 {}_2P_s(x) \quad \ldots\ldots(3)$$

where n = number of observations in each group,

$\sum_1$ and $\sum_2$ = summation over first and second groups respectively.

26. Because of the observed tendency to exaggerate ages at older age groups, the method excludes proportions above age 60. For the purpose of calculation, the observed and reference standard age distributions at 5 year intervals from 5 to 60 years inclusive are separated into two equal groups arranged in order of age. The first group consists of proportions in ages 5, 10, 15, 20, 25 and 30 while the second consists of 35, 40, 45, 50, 55 and 60. The procedure is sometimes repeated for ages 5 to 50 (Group 1: 5, 10, 15, 20 and 25; Group 2: 30, 35, 40, 45 and 50) and ages 5 to 40 (Group 1: 5, 10, 15 and 20; Group 2: 25, 30, 35 and 40) to choose the best fit in any given situation.

27. However, there is need for caution in the use of the age distribution derived on the basis of the Brass logit difference approach. This is because, in retrospect, the intercept (a) and slope (b) derived on the basis of the reported and reference standard age distributions are used to adjust the reported age distribution. In effect, as in the case of the quasi-stable model approach, the same problem of subjectivity in selecting the stable population parameters is still there with the logit approach. The main difference between the two lies in the fact that whereas with the quasi-stable approach the reference age distribution is borrowed without any adjustment and hence may not reflect the peculiarities in the data; the logit approach makes room for such an adjustment. To this extent, therefore, it is an improvement over the quasi-stable approach.

28. The advantage claimed in using the Brass logit method is that some of the peculiarities of the observed distribution are reflected in the fitted distribution unlike the stable population model method. The question here is whether this is really an advantage, when some of the peculiarities of the data may be due to the very errors which the analyst seeks to remove or at least minimise in the adjusted age-sex data. This contention is illustrated with examples of adjusted age-sex data from a few member States.

29. In the evaluation and analysis of the 1976 census age-sex data of Swaziland, the Brass logit method was applied to graduate the data and the results in Table 8 are given for a portion of the age distribution only to illustrate the point. From the data, one easily notes from the adjusted and projected proportions (0-4), that the adjusted percentage at age 0-4 for 1981 is not consistent with the estimated fertility parameter. The basic shape of the graduated distribution was dictated by that of the reported distribution which comprised a rather smaller 1981 proportion of children (17.6 per cent) than would be implied (19.0 per cent) by the estimated fertility and mortality rates. Thus the projected figures show a slight irregularity at the point where the new birth cohorts are fed in.

30. Another observation based on the projection of the Swaziland population is related to the sex ratio of the population. Whereas at base date (1976) it was taken as 95.0, it increased to 95.1 in 1981 and 95.2 in 1986 contrary to what one might have expected from the improvement in mortality which already had a great advantage for the females. The actual problem came from the child population whose sex ratio played a great role in determining the sex ratio of the population. As time passes, the sex ratio of a population is much influenced by the sex ratio of the child population and their survivors. If the sex ratio at birth is taken as high or low, the effect would be reflected on the overall sex ratio. In this particular case perhaps the assumed sex ratio at birth of 103 for the projections seems too high and may be only 102 or even 101.

31. A similar experience is noted in the case of Botswana where the logit method produced an adjusted population distribution which was at variance with the implied fertility-mortality estimates. Since the data showed not much age-sex reporting errors, the UN method of adjusting the population 0-4, the adult and old age groups resulted in a distribution which tallied with the fertility-mortality conditions. Table 9 gives the results obtained.

32. After adjusting the age-sex data, it is very difficult to assert that it is the best under the circumstances because one does not know what the true age-sex distribution of the population is without the inherent errors, biases and deficiencies. A rule of thumb is that it is better to apply a battery of adjustment techniques and search for the one which deviates minimally from the observed or estimated fertility-mortality situations. Several forward and backward projections need be carried out using the age-sex distribution and the fertility-mortality estimates and the performance and consistency of the adjusted data be studied.

33. To illustrate the use of the Brass logit technique for smoothing reported age-sex distributions needed for population projections, the results obtained in applying the technique to the age-sex data from the 1976 census of Egypt are reproduced in Table 10. The derived total population by sex for 1980 was distributed by age using the smoothed 1976 distribution. This was projected backwards and forwards on the basis of assumptions regarding the growth components. The resulting sex ratios for 1950 clearly indicate the fact that there were problems with the smoothed age distribution adopted for the base year 1980.

34. When age-sex data are adjusted by some of the techniques mentioned earlier, it may so happen that the sum of the adjusted population in the various age groups may differ from the enumerated figure. The question then is: should the figure be prorated to the enumerated population or should one keep the adjusted figures? Even though the adjustments may be really necessary in order to remove the errors, deficiencies and biases in the age-sex data, since the census reported population is generally better known and accepted by the country and others and moreover, different evaluations and adjustments may result in varying adjusted population figures, it is advisable to keep the total population by sex same as the census enumerated figure and prorata adjust the age distribution accordingly. However, if a different base year or period is utilised, especially while carrying out a projection exercise, it is preferable to utilise the adjusted populations by age and sex as also the total population so obtained and carry it forward or backward for the required length of time with estimated growth rates in order to obtain the needed base age-sex distribution.

35. Besides the foregoing indirect adjustment techniques, errors in reported age-sex data can be adjusted directly, Because age-sex data from post-enumeration surveys (PES) are often based on more carefully planned and collected information, they may be used to adjust the age-sex distribution from the main census. Table 11 presents the effects of adjusting the male age data from the 1974 census of Liberia. It can be seen that not only did the age distribution become closer to a stable model, the estimated birth rates also are closer. The sum of squares of deviations from unity of the ratios of stable to the observed is reduced. Thus if PES or other extraneous information of a better quality were available, it seems useful to use these to adjust observed age-sex distribution of population and any other types of deficiencies in the data.

V. CONCLUDING REMARKS

36. Adjustment techniques have not yet reached a stage where routine techniques can be applied without other tests. Fortunately, most of the adjustment techniques and forward and backward projections are computerized and often these techniques can even be carried out with a programmable electronic calculator. The demographer analyst should devote enough time and attention to study the results of these and only then select the final adjusted distribution.

37. Adjustment of data is still an art and experience and knowledge of the population is very essential in carrying out a realistic adjustment. Sometimes one is caught in the vicious circle of quality of data biasing estimates of fertility and mortality and biased estimates of fertility and mortality misleading the analyst regarding the adjustments needed. Since prevention is better than cure, it is strongly recommended that more efforts be put in improving the collection of the data from the field. Education, use of aids in estimating ages, better enumerators, stricter supervision, quality controls at all stages of data processing, etc. would yield dividends in terms of improved quality of the data.

38. No amount of adjustment can improve a given data and any pains taken to assure better quality data from the field and guarding against further deterioration in the processing of the collected data would be worth the while. It is gratifying to note that the quality of data has certainly improved in the member States where a comparison could be carried out. As many of these States had their first experience during the 1980 round only, the opportunity to improve the basic data collected and processed depends on the statistical office and systems in the member States concerned.

Table 1: Distribution of Age and Sex ratio scores, Joint score index, Myer index and data quality rating for selected ECA member States

Country	Census Year	Age ratio Score M	Age ratio Score F	Sex ratio Score	Joint Score Index a/	Quality Rating	Myers Index M	Myers Index F
NORTHERN								
Algeria	1977	5.3	5.5	3.2	20.2	A		
Egypt	1976	10.2	14.2	8.1	48.7	C		
Libyan A. Jamahiriya	1973	5.6	11.0	6.1	34.9	B	9.8	25.8
Morocco	1971	14.2	25.2	16.2	88.0	C		
Sudan	1973	18.3	20.6	8.7	65.2	C	48.2	58.0
Tunisia	1975	6.9	5.2	5.3	28.0	B		
WESTERN								
Burkina Faso	1975	10.1	14.1	10.4	54.5	C		
Cape Verdé	1980	15.5	13.3	6.4	48.0	C		
Gambia	1983	15.1	24.9	13.4	80.2	C	42.9	50.7
Ghana	1970	8.3	11.6	7.6	42.7	C	26.8	31.2
Ivory Coast	1975	5.8	9.2	10.6	46.8	C		
Liberia	1974	11.2	14.6	11.8	61.2	C	27.5	29.4
Mauritania	1977	9.6	25.1	14.3	77.6	C		
Mali	1976	9.6	19.5	12.2	65.6	C		
Niger	1977	26.6	47.0	26.7	153.7	C		
Nigeria	1963	29.0	36.4	14.1	107.7	C		
Senegal	1976	4.8	9.7	14.2	56.9	C		
Sierra Leone	1974	13.2	16.1	8.5	54.6	C	44.4	47.2
Togo	1970	18.7	19.0	11.6	72.5	C		
CENTRAL								
C.A. Republic	1975	18.9	26.2	9.7	74.2	C		
Congo	1974	4.9	4.1	5.2	24.7	B		
Gabon	1960	11.4	13.2	10.0	54.5	C		
Sao Tomé & Principé	1981	7.3	5.4	5.5	29.2	B		
U.R. of Cameroon	1976	5.6	6.8	5.6	29.2	B		
EASTERN								
Burundi	1979	7.2	10.6	5.2	33.4	B		
Djibouti	1983	15.9	20.5	9.9	65.9	C		
Kenya	1979	3.4	4.0	4.2	20.8	B	12.4	15.4
Madagascar	1975	4.0	5.8	5.0	24.8	B		
Malawi	1977	14.4	9.2	8.3	48.4	C	12.9	16.6
Mauritius	1983	11.5	8.4	4.4	33.1	B	2.1	2.3
Mozambique	1980	10.9	12.6	8.0	47.4	C		
Rwanda	1978	6.6	6.5	3.7	24.1	B		
Seychelles	1980	5.8	6.1	5.9	29.5	B		
U.R. Tanzania	1978	10.1	8.8	9.1	46.1	C	25.2	32.1
Uganda	1969	8.5	12.4	8.9	47.7	C	24.6	33.3
Zambia	1980	14.8	8.3	14.7	67.2	C	14.1	15.3
SOUTHERN								
Botswana	1981	3.0	5.3	5.3	24.1	B	7.1	6.8
Lesotho	1976	9.2	8.7	5.3	33.8	B	10.4	9.6
Swaziland	1976	8.9	6.2	5.6	31.9	B	14.1	14.7

Source: Various country distributions of single and five year of age by sex data for census year.

a/ Based on ages 0-69 in each case by sex.

Table 2: Age ratio, Sex ratio and Joint Scores for selected countries from their recent two censuses

Country	Year	Age ratio score M	Age ratio score F	Sex ratio Score	Joint Score	Myers Index M	Myers Index F
Ghana	1960	12.4	14.4	8.8	53.2	29.6	31.2
	1970	8.3	11.6	7.6	42.7	26.8	31.2
Kenya	1969	5.1	7.4	6.7	32.6	21.2	22.2
	1979	3.6	4.0	4.2	20.2	12.4	15.4
Lesotho	1966	10.0	9.7	6.5	39.2	11.8	12.8
	1976	9.2	8.7	5.3	33.8	10.4	9.6
Libya	1964	13.4	21.1	14.4	77.7	46.5	70.3
	1973	5.6	11.0	6.1	34.9	9.8	25.8

Table 3: Reported and smoothed age-sex distributions and indices of dissimilarity for Morocco, 1971

Age Group	Reported		CF Smooth		QD Smooth		OS Smooth	
	M	F	M	F	M	F	M	F
0-4	16.5	16.3	16.4	16.1	16.4	16.1	16.7	17.2
5-9	16.4	16.0	16.4	15.9	16.4	15.9	16.2	14.9
10-14	14.5	13.0	13.7	12.3	13.5	12.3	13.8	12.4
15-19	9.8	9.3	10.6	10.0	10.9	10.0	10.5	9.9
20-24	6.6	7.2	6.6	7.5	6.8	7.6	6.9	7.5
25-29	5.3	6.6	5.3	6.4	5.1	6.3	5.0	6.3
30-34	5.1	6.5	5.4	6.4	5.3	6.4	5.2	6.3
35-39	5.1	5.5	4.9	5.6	4.9	5.7	5.0	5.7
40-44	4.6	5.1	4.4	4.6	4.3	4.5	4.4	4.6
45-49	3.5	3.0	3.7	3.6	3.8	3.6	3.7	3.6
50-54	3.5	3.2	3.0	2.5	3.0	2.6	3.0	2.6
55-59	2.0	1.3	2.5	2.1	2.5	2.0	2.4	2.0
60-64	2.3	2.6	2.0	2.0	2.0	2.0	2.0	1.9
65-69	1.3	1.1	1.6	1.7	1.6	1.7	1.6	1.8
70-74	1.6	1.7	1.6	1.7	1.6	1.7	1.3	1.5
75-79	0.6	0.5	0.6	0.5	0.6	0.5	1.0	0.7
80+	1.3	1.1	1.3	1.1	1.3	1.1	1.3	1.1
Index of dissimilarity with reported	-	-	1.95	3.10	2.60	3.20	2.55	4.15

CF = Carrier-Farrag ratio method

QD = Newton's quadratic method

OS = Osculatory graduation method

Table 4: Reported and smoothed age-sex distribution and indices of dissimilarity for Ghana, 1970

Age Group	Reported		CT Smooth		QD Smooth		OS Smooth	
	M	F	M	F	M	F	M	F
0-4	18.1	18.3	18.2	18.2	18.4	18.3	20.0	20.6
5-9	17.5	16.7	17.1	16.7	17.1	16.7	15.5	14.5
10-14	12.0	11.3	12.0	11.0	12.1	11.2	12.1	10.9
15-19	9.4	8.8	9.5	9.1	9.4	8.9	9.4	9.2
20-24	7.2	8.7	7.6	8.9	7.6	8.8	7.5	8.7
25-29	6.8	7.9	6.5	7.8	6.4	7.8	6.5	7.9
30-34	6.2	6.9	6.2	6.6	6.1	6.6	6.1	6.6
35-39	5.2	5.0	5.3	5.3	5.3	5.4	5.3	5.3
40-44	4.1	4.1	4.2	4.0	4.2	4.0	4.2	4.0
45-49	3.4	3.0	3.3	3.1	3.3	3.0	3.3	3.0
50-54	2.8	2.6	2.6	2.3	2.6	2.3	2.6	2.3
55-59	1.8	1.5	2.0	1.8	2.0	1.8	2.0	1.8
60-64	1.8	1.6	1.7	1.5	1.6	1.5	1.6	1.5
65-69	1.1	1.1	1.2	1.2	1.3	1.2	1.3	1.2
70-74	1.0	0.9	1.0	0.9	1.0	0.9	0.9	0.9
75-79	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5
80+	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Index of dissimilarity with reported	-	-	1.20	1.30	1.30	1.05	2.95	3.40

Table 5 : Reported and smoothed age-sex distribution and indices of dissimilarity for United Republic of Cameroon, 1976

Age group	Reported		CF Smooth		QD Smooth		OS Smooth	
	M	F	M	F	M	F	M	F
0-4	17.5	16.6	17.4	16.6	17.4	16.6	18.2	17.6
5-9	15.6	14.6	15.8	14.6	15.6	14.6	15.0	13.6
10-14	12.1	10.4	12.1	10.9	12.1	11.0	12.1	10.9
15-19	9.6	9.7	9.7	9.2	9.6	9.1	9.6	9.2
20-24	7.2	8.2	7.4	8.3	7.5	8.3	7.5	8.2
25-29	6.4	7.5	6.2	7.4	8.2	7.4	6.2	7.4
30-34	5.4	6.4	5.8	6.7	5.8	6.7	5.7	6.7
35-39	5.5	6.2	5.2	5.8	5.2	5.9	5.2	5.9
40-44	4.6	4.9	4.7	5.0	4.7	4.9	4.7	5.0
45-49	4.2	4.1	4.1	4.1	4.1	4.1	4.1	4.1
50-54	3.4	3.3	3.3	3.2	3.3	3.2	3.3	3.2
55-59	2.6	2.4	2.6	2.5	2.6	2.5	2.6	2.5
60-64	2.2	2.1	2.0	1.8	2.0	1.8	2.0	1.8
65-69	1.2	1.1	1.4	1.3	1.4	1.3	1.4	1.3
70-74	1.0	1.1	1.0	1.1	1.0	1.1	0.9	0.9
75-79	0.6	0.5	0.6	0.5	0.6	0.5	0.6	0.7
80+	0.9	0.9	0.9	1.0	0.9	1.0	0.9	1.0
Index of dissimilarity with reported	-	-	0.95	1.50	0.95	1.40	1.55	2.50

Table 6: Reported and smoothed age-sex distributions and indices of dissimilarity for Kenya, 1969

Age Group	Reported		CF Smooth		QD Smooth		OS Smooth	
	M	F	M	F	M	F	M	F
0-4	19.3	19.2	19.3	19.3	19.4	19.3	19.8	20.1
5-9	16.8	16.4	16.7	16.4	16.7	16.4	16.2	15.4
10-14	13.0	12.2	13.0	12.2	13.0	12.3	13.0	12.2
15-19	10.2	10.0	10.3	9.9	10.3	9.8	10.2	10.0
20-24	7.8	8.2	7.9	8.6	7.9	8.6	7.9	8.6
25-29	6.4	7.5	6.3	7.1	6.2	7.1	6.3	7.2
30-34	5.1	5.5	5.3	5.7	5.3	5.7	5.3	5.7
35-39	4.6	4.8	4.4	4.6	4.4	4.6	4.4	4.6
40-44	3.5	3.7	3.7	3.7	3.7	3.7	3.7	3.7
45-49	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50-54	2.4	2.5	2.5	2.4	2.5	2.4	2.5	2.4
55-59	2.1	1.9	2.0	2.0	2.0	2.0	2.1	2.0
60-64	1.9	1.7	1.8	1.7	1.8	1.6	1.8	1.6
65-69	1.4	1.2	1.4	1.2	1.4	1.3	1.5	1.3
70-74	0.9	0.8	0.9	0.8	0.9	0.8	1.0	0.9
75-79	0.6	0.5	0.6	0.5	0.6	0.5	0.4	0.4
80+	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Index of dissimilarity with reported	-	-	0.78	0.75	0.75	0.95	1.30	1.85

Table 7: Reported and smoothed age-sex distributions and indices of dissimilarity for Lesotho, 1976

Age group	Reported		CF Smooth		QD Smooth		OS Smooth	
0-4	14.7	13.7	14.7	13.6	14.8	13.5	14.0	12.9
5-9	13.4	12.4	13.4	12.4	13.4	12.4	13.9	13.2
10-14	13.2	12.5	12.6	12.4	12.5	12.3	12.6	12.4
15-19	10.2	10.7	10.8	10.9	10.9	11.0	10.8	10.8
20-24	8.4	8.9	8.5	8.6	8.5	8.7	8.6	8.8
25-29	7.1	6.8	7.0	7.0	7.0	7.0	6.9	6.9
30-34	5.6	5.5	5.8	5.5	5.8	5.6	5.8	5.5
35-39	5.2	4.8	5.1	4.8	5.0	4.7	5.1	4.8
40-44	5.3	5.2	4.9	4.7	4.9	4.7	4.8	4.7
45-49	4.0	3.8	4.4	4.3	4.4	4.3	4.4	4.3
50-54	3.3	3.3	3.8	3.7	3.7	3.7	3.8	3.7
55-59	3.5	3.5	3.0	3.1	3.0	3.1	3.0	3.1
60-64	2.1	2.5	2.1	2.4	2.1	2.4	2.2	2.4
65-69	1.5	1.8	1.5	2.0	1.5	2.0	1.5	1.9
70-74	1.0	1.6	1.0	1.6	1.0	1.6	1.0	1.8
75-79	0.9	1.6	0.9	1.6	0.9	1.6	1.0	1.6
80+	0.6	1.4	0.6	1.4	0.6	1.4	0.6	1.4
Index of dissimilarity with reported	-	-	1.80	1.45	1.90	1.60	2.55	2.05

Table 8: Reported, adjusted and projected female proportional age distribution for Swaziland

Age group	1976 Reported (%)	1976 Adjusted (%)	1981 Projected (%)	1986 Projected (%)
0 - 4	17.0	17.6	19.0	19.0
5 - 9	15.1	14.7	14.1	15.3
10 -14	12.8	12.6	12.3	11.8

Source: Kingdom of Swaziland (Central Statistical Office), Report on the 1976 Swaziland Population Census, Vol. I and III, 1979-80.

Table 9: Comparison of adjusted and projected population distributions by using logit method and UN adjustment techniques to female population, Botswana 1981.

Age Group	Reported (%)	Logit		UN Method	
		Adjusted (%)	1986 Projected (%)	1991 Projected (%)	Adjusted (%)	1986 Projected (%)	1991 Projected (%)
0-4	17.3	18.4	17.8	16.9	18.1	18.6	18.1
5-9	15.1	14.0	15.0	15.0	15.0	15.0	15.4
10-14	12.3	11.7	11.9	13.1	12.3	12.6	12.6

Source: Republic of Botswana (Central Statistical Office), Draft report on the Analysis of the 1981 Census (ECA communication) and Report on the Analysis of 1981 Census, Gaborone, 1985.

Table 10: Reported and adjusted age-sex distribution for Egypt

Age Group	1976 Reported % Male	Female	1976 Adjusted % Male	Female	Sex ratios 1976	1980	1950
0-4	13.6	13.9	14.6	14.5	97.8	104.4	102.6
5-9	13.0	12.6	13.0	12.7	103.2	106.2	100.9
10-14	13.8	12.9	11.7	11.4	107.0	106.4	101.0
15-19	11.4	10.3	10.3	10.2	110.7	104.7	101.5
20-24	8.2	8.7	9.0	9.0	94.3	103.7	102.2
25-29	7.1	7.6	7.8	7.9	93.4	102.4	106.9
30-34	5.6	6.1	6.8	6.9	91.8	102.2	109.1
35-39	5.5	5.7	5.8	6.0	96.5	100.2	111.8
40-44	5.0	5.3	4.9	5.1	94.3	99.6	123.9
45-49	4.2	4.1	4.1	4.3	102.4	98.9	499.2
50-54	3.9	4.1	3.4	3.6	95.1	97.9	499.2
55-59	2.6	2.3	2.8	2.9	113.0	100.1	593.2
60-64	2.6	2.7	2.1	2.2	96.3	99.0	680.5
65-69	1.5	1.3	1.6	1.6	115.4	97.6	781.6
70-74	1.1	1.3	1.0	1.0	84.6	103.7	975.0
75-79	0.5	0.7	0.7	0.5	71.4	145.2	1159.0
80+	0.4	0.4	0.4	0.1	100.0	414.8	1726.8
Total	100.0	100.0	100.0	100.0	103.7	103.7	124.9

Table 11: Evaluation of adjusted data by using PES information - Liberia, 1974 (males)

Age group	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44
C(a)	15.18	30.28	41.81	51.77	56.94	66.02	72.22	78.46	83.22
C(a)§	15.39	30.55	42.14	52.75	60.13	67.21	73.45	79.65	84.21
CBR	39.77	43.93	43.30	42.71	40.30	39.35	38.45	38.81	38.14
CBR§	40.39	44.43	43.80	44.07	41.83	40.90	40.13	40.63	39.98
CBR (Mid Range)				4.53			3.41§		
Sum of squared deviations				.098			.081§		

§ These pertain to adjusted values.

Source: Ewbank, D.C., Age misreporting and age selective underenumeration;

Sources Patterns and Consequences for Demographic Analysis, National Academy Press, Washington, D.C. 1981.

Outline of the Ratio (CF) Quadratic (QF), Osculatory (OS) and 5 point moving average (UN) smoothing procedures

To smooth a population distribution of 5-year age groups, the CF, QD and OS procedures first group the 5-year age groups into 10-year age groups before separating the 10-year age groups into 5-year age groups.

(i) The Carrier-Farrag (CF) ratio method assumes that there exists a relationship between the population in 5-year age groups such that

$$5^{P}x = K_{(5^{P}x + 5)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where $5^{P}x$ = population in the age group x, x+9

Then the population in a 10-year age group is given by

$$10^{P}x = 5^{P}x + 5^{P}x+5 = K_{(5^{P}x+5)} + 5^{P}x+5$$

$$= 5^{P}x+5\ (1 + K) \quad \ldots\ldots\ldots\ldots \quad (2)$$

Hence

$$5^{P}_{x+5} = 10^{P}x/(1 + K) \quad \text{and} \quad 5^{P}x = 10^{P}x - 5^{P}x+5$$

Assuming that the four 5-year age groups between ages X-10 and X+10 have the same average rate K, the estimation of K is made as follows:

$$K = \left(\frac{10^{P}x-10}{10^{P}x+10} \right) 1/4 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

(ii) According to the quadratic procedure,

$$5^{P}x = 1/2 \left(10^{P}x\right) + \frac{1}{16} \left(10^{P}x-10 - 10^{P}x+10\right) \quad \ldots\ldots\ldots\ldots \quad (4)$$

and

$$5^{P}x+5 = 10^{P}x - 5^{P}x \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

(iii) The Sprague Osculatory procedure uses two polynomials. A third degree polynomial is used for breaking down the first two and two last 10-year age groups. For intermediate 10-year age groups, a fourth degree polynomial is used. For the first age group, the formula is

$$5^{P}0 = E_1(10^{P}0) + E_2\ (10^{P}10) + E_3\ (10^{P}20) + E_4\ (10^{P}30) \quad \ldots\ldots \quad (6)$$

and for a central age group,

$$5P_x = C_1(10P_{x-20}) + C_2(10P_{x-10}) + C_3(10P_x) + C_4(10P_{x+10}) + C_5(10P_{x+20}) \quad \ldots\ldots\ldots\ldots(7)$$

where C_i and E_i = the coefficients 1/ for central and extreme age groups.

(iv) Regarding the UN procedure, the formula is

$$5P^S_x = 1/16 \; (-5P_{x-10} + 4\,5P_{x-5} + 10\,5P_x + 4\,5P_{x+5} - 5P_{x+10}) \quad \ldots\ldots\ldots\ldots\ldots\ldots(8)$$

where $5P^S_x$ = the smoothed age group x, x+4

and

$5P_x$ = the reported age group x, x+4.

1/ Details of these coefficients are contained in Arriage, E. et al, Computer Programmes for Demographic Analysis (Bureau of the Census, 1976) pp. 488-489.